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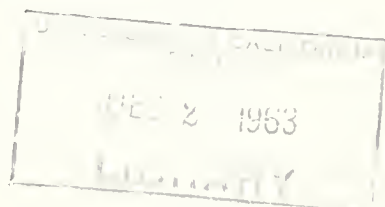
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THE RESOURCES AGENCY OF CALIFORNIA
Department of Water Resources

BULLETIN No. 119-8

FEASIBILITY OF SERVING
THE KERN COUNTY WATER AGENCY
FROM THE STATE WATER PROJECT

SEPTEMBER 1963



HUGO FISHER
Administrator
The Resources Agency of California

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Director
Department of Water Resources

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FOREWORD

In November 1960, the California Water Resources Development Bond Act was approved by the State's electorate, paving the way for the construction of the State Water Project as the first phase of the California Water Plan. Since that time, many local water service agencies throughout the State have applied to the Department of Water Resources for consideration as potential contractors with the State for water service from the proposed facilities. Several water agencies have been organized since November 1960 expressly for the purpose of obtaining supplemental water supplies from the state facilities for the areas they represent.

Prior to executing water supply contracts with water agencies, the Department of Water Resources makes studies of those agencies and the areas encompassed by them to determine the propriety of entering into such contracts. These studies are made with the goal of evaluating (1) each area's future demand for supplemental water supplies, (2) the legal ability of each agency in question to enter into a water supply contract with the State, (3) the engineering feasibility of providing the proposed water service, and (4) the financial ability of the agency contracting for a supplemental water supply from the State Water Project.

The results of the studies made for each agency, as described above, along with significant incidental and supporting material, are embodied in reports published by the Department of

Water Resources. This bulletin is one of a series of such publications and deals with the Kern County Water Agency.

RECOMMEND APPROVAL:

Carl L. Stetson

Carl L. Stetson, Chief
San Joaquin Valley Branch

Date September 6, 1963

APPROVED:

William E. Wame

Director

Date September 6, 1963

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STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

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CHAPTER I. INTRODUCTION

Since November 1961 the Kern County Water Agency has been negotiating a contract with the Department of Water Resources for a supplemental water supply from the State Water Project. Presented in this report are factual data concerning the Kern County Water Agency which demonstrate the need and the feasibility of a contract between the State and the Agency for an annual supplemental supply to the Agency of 1,000,000 acre-feet of water from the facilities of the State Water Project.

The report demonstrates that, under the conditions set forth in the analysis presented, the proposed contract is feasible and the Kern County Water Agency can pay the necessary costs.

The Agency and its history, powers, and service area are briefly described in this chapter. Also included is a statement concerning the water supply available to the San Joaquin Valley from the State Water Project. In the following chapters are discussions of historical and future development of the economy of the service area, the potential agricultural water demand, and the cost of water service from the State Water Project. This is followed by a presentation of the demand for project water as limited by cost of water, and the report is concluded with an analysis of the financial feasibility of the State's serving the Kern County Water Agency.

Soon after negotiations with the Agency were opened, the department's brochure dated December 1961 and entitled "Summary of Information Relating to the Negotiation of a State Water Supply Contract with the Kern County Water Agency" was presented to the Agency and discussed. Other reports available for consideration were the "Staff Report on Water Resources of Kern County, California" published by the office of the surveyor of Kern County, and "Economic Demand for Project Water," Appendix D of the department's Bulletin No. 78 entitled "Investigation of Alternative Aqueduct Systems to Serve Southern California." These reports, along with the prototype water supply contract between the State and The Metropolitan Water District of Southern California, the "Standard Provisions for Water Supply Contract," approved August 3, 1962, and Bulletin No. 132-63, "The California State Water Project in 1963," provided the bases for negotiation.

During 1962 and 1963 numerous meetings were held with the directors of the Agency, the Agency's negotiating committee, and the Agency's consulting engineers. A number of studies of repayment were made and repayment tables were presented by the department to show charges which would be made by the State to the Kern County Water Agency for water under different assumptions as to maximum annual entitlement, buildup of demand, points of delivery, and peaking capacities in terms of percent of annual entitlement. In August 1962, the department received a copy of the "Preliminary Analysis of Payment Ability of Kern County Water Agency by the Kern County Water Agency Negotiating Committee."

In November 1962 the Agency presented its "Report on the Capacity of Kern County Agriculture to Pay for Irrigation Water at the Farm Headgate," which was prepared by its consulting engineers, Leeds, Hill and Jewett, Inc., and "Quantitative Economic Study of Representative Kern County Farm Enterprises," by Francis A. Moore, Jr., C.P.A., and Park J. Ewart, Ph.D., Business Economics Statistician.

During the negotiations it became evident that the Agency would not have the ability to pay for the 1,400,000 acre-feet of water it had originally requested. Consequently, studies were made to determine means of reducing the average cost of water to farmers in the Agency service area, means of determining an equitable assessment of the indirectly benefited areas, or a combination of these, and to achieve a balance between the resulting cost of water and the amount of water that could be taken at that cost. At a high cost of water, only the urban areas and the lands capable of producing high value crops could take water.

Attempts were made during the period of negotiation to obtain legislation which would lower water charges. The Agency would be able to lower its average charge to water users, especially in the early years of development, and thus allow agriculture to participate in the project to a larger extent if some relatively minor amendments were made in the prototype water supply contract. These amendments involve modifications in the surplus water provisions of the prototype contract to

give preferential treatment to the sale of surplus water for agriculture and ground water replenishment uses. They also provide the authority for including in contracts provisions to allow, within limits, a credit to a contractor in the amount of the surcharge collected from users within the contractor's service area. These proposals were recommended to the department by the 1963 General Session of the Legislature through the enactment of Assembly Concurrent Resolution 93 (Williamson, Casey, Stiern). The financial analysis in this report assumes these proposals will be included in the contract with the Kern County Water Agency. The department has proposed to other water supply contractors that their contracts be amended to facilitate the inclusion of these provisions. Several of these contractors, including the San Bernardino Valley Municipal Water District, have agreed to these amendments.

The Kern County Water Agency

For some years prior to the formation of the Kern County Water Agency, it was generally recognized that an additional supplemental water supply was essential to stabilize the economy of the county. The Kern County Board of Supervisors studied the need for a county-wide water agency to obtain a supplemental water supply. As a result, legislation to create the Kern County Water Agency was introduced in the State Legislature as Assembly Bill 2455 (Williamson, Casey, Stiern) in 1961. The bill was subsequently passed with minor amendments and the

Agency was formed by the 1961 Legislature (Kern County Water Agency Act, Calif. Stats. 1961, C.1003, p. 2651). The Agency was authorized to function and to exercise its powers by the necessary majority of voters of Kern County on September 26, 1961, as provided by Section 7 of the act.

Powers of the Agency

General Powers. The Kern County Water Agency may acquire water supplies and enter into allied activities such as flood control, drainage, and generation of hydroelectric energy. The Agency may construct works including distribution systems. Any public district or political subdivision of the State within or partially within the county which is empowered by law to appropriate water and deliver water to water users may elect to become a "member unit" of the Kern County Water Agency. A member unit is defined as any public district which enters into a contract with the Agency for services which the Agency is to provide. The Agency may also contract with mutual water companies which develop and distribute water within the county.

Power to Contract with the State. The Kern County Water Agency may cooperate with and contract with the United States, the State of California, and other entities for the purchase, sale, or exchange of water and in the acquisition of a water supply.

A proposal to enter into a contract with the State for repayment of construction money, repayment of the cost of acquiring any property, or issuance of bonds must be authorized by a majority of voters in the Agency.

Taxing Powers. The Board of Directors of the Kern County Water Agency has available three sources of funds which are:

1. An ad valorem tax of not to exceed 5 cents on each \$100 of the assessed valuation of all taxable property in the Agency.

2. Special ad valorem assessments apportioned in accordance with benefits for the purpose of making payments pursuant to contracts with the United States or the State. For this purpose zones of benefit may be established which reflect the degree of benefit resulting to each zone from such contracts. Assessments shall be levied on all taxable property within each zone on an ad valorem basis.

3. Contracts with member units whereby the member units agree to pay in accordance with an established schedule for direct surface water deliveries.

The Agency's Service Area

The Kern County Water Agency encompasses all of the County of Kern as shown on Plate 1, "Location of Kern County Water Agency." Kern County includes the southern end of the San Joaquin Valley and extends into the Mojave Desert to the south and east. The county is very rich agriculturally and has ranked among the top five counties in the nation in total farm production for over two decades. This outstanding rank in farm production is attributed to the long growing season, good soils,

and irrigation. Without irrigation much of the land would revert to very low use.

This report deals with the portions of the county which have indicated through the Agency a desire to be served a water supply from the State Water Project. The Kern County Water Agency Service Area is shown on Plate 2. It consists of an area of about 900,000 acres of land in the San Joaquin Valley, the Tehachapi-Cummings Water Conservation District in the Tehachapi Mountains, and a prospective urban area in the vicinity of the Tejon Ranch headquarters near Lebec.

Located within the service area are the following potential member units. The approximate areas of these units are shown below:

Potential Member Units of Kern County Water Agency	: Approximate :Area in Acres
---	---------------------------------

Districts

Antelope Plain Water District	43,000
Belridge Water Storage District	84,400
Lost Hills Water District	63,500
Rosedale-Rio Bravo Water Storage District	43,700
Semitropic Water Storage District	224,200
Tehachapi-Cummings Water Conservation District (urban)	-
West Kern County Water District (Taft agriculture and Taft urban) ^{1/}	-
Wheeler Ridge-Maricopa Water Storage District	127,500

Other Areas

Bakersfield Urban Area	-
Kern River Delta Area and Others	371,000 ^{2/}
Tejon Ranch Headquarters Area (urban)	-

^{1/} Taft agriculture and Taft urban areas used in this report approximate the West Kern County Water District.

^{2/} Includes Bakersfield urban area.

X The climate of the San Joaquin Valley portion of the service area is characterized by hot, dry summers and cool winters. The area is relatively arid with a weighted average rainfall of about 6 inches, most of which falls in the winter. In the vicinity of Bakersfield maximum and minimum mean temperatures in July, the hottest month, are 102° and 72° Fahrenheit, respectively. In January, generally the coldest month, the maximum and minimum mean temperatures are 56° and 40°, respectively. These temperatures are generally typical of the valley service area, most of which lies between elevations 250 feet and 600 feet. The highest elevation in the area is about 1,500 feet.

Although killing frosts occur during the winter months, there is evidence of the existence of thermal belts on the slopes above the valley floor in which citrus can be grown. Below these belts chilling temperatures are sufficient to allow the production of orchard crops requiring periods of dormancy. The department is presently conducting a study on the western and southern slopes of the valley to determine the potential crop adaptability of the land on these slopes.

The Tehachapi-Cummings Water Conservation District is composed primarily of land within Tehachapi, Cummings, and Brite Valleys, most of which is at an elevation of about 4,000 feet. The Tejon Ranch headquarters area is at an elevation of about 3,500 feet. Because of the high cost of lifting water from the California Aqueduct, it has been assumed for purposes

of this report that water conveyed to both areas would be used only for municipal and industrial purposes.

Water Supply Available to San Joaquin Valley
From State Water Project

The California Water Commission has assigned certain state applications for appropriation of water to the department for the operation of the State Water Project. The applications show that as of June 1963 the water appropriated would be used in the following service areas:

Feather River	210,000 acre-feet
North Bay	210,000 acre-feet
South Bay	210,000 acre-feet
San Joaquin Valley	1,547,000*acre-feet
Central Coastal	85,000 acre-feet
Southern California	<u>1,888,000</u> acre-feet
Total	4,150,000 acre-feet

Although the above tabulation shows 4,150,000 acre-feet of water would be diverted for use in the indicated service areas, the prototype contract states that the contracted maximum annual entitlement may not in the aggregate exceed 4,000,000 acre-feet or the minimum project yield, whichever is the lesser. The term "minimum project yield" is defined in Article 1(k) of

*Includes 36,000 acre-feet reserved for San Joaquin Valley but not to be transferred from South Bay and Central Coastal allocations until needed and 36,000 acre-feet transferred from North Bay and Feather River allocations to an unallocated pool held in reserve for San Joaquin Valley when and if needed and for any other area of the State if not required in the San Joaquin Valley.

the "Standard Provisions for Water Supply Contract", and is now estimated to be 4,000,000 acre-feet. As of September 1963, no water supply contracts have been completed in the San Joaquin Valley service area.

In addition to annual entitlements under water supply contracts, surplus water will be available from the project. The amounts of surplus water assumed to be delivered on an irrigation demand schedule to the Kern County Water Agency are shown in Column 3 of Table 16.

CHAPTER II. HISTORICAL AND FUTURE DEVELOPMENT OF ECONOMY

The economy and the population growth in Kern County have been closely associated with irrigated agriculture and the petroleum industry. In recent years Kern County has been third to Fresno and Tulare Counties in total value of agricultural crop and livestock production in the United States. It is the largest producer of minerals in California, with the value of mineral production exceeding that of agriculture.

Population

Kern County had a population of 291,984 according to the 1960 Federal Census. Approximately 200,000 people lived in cities having populations of 2,500 or more. It is estimated that the 1960 population within the Kern County Water Agency Service Area was about 195,000, of which approximately 154,000 persons lived in the urban areas of Bakersfield and Taft, about 32,000 lived on farms, and about 5,000 lived in rural areas other than farms.

The Department of Water Resources with the assistance of consultants and other agencies has prepared population forecasts of Kern County. These are tabulated along with the historical population data in Table 1, "Historical and Projected Population Within the Kern County Water Agency Service Area and Kern County."

TABLE 1

HISTORICAL AND PROJECTED POPULATION
WITHIN THE KERN COUNTY WATER AGENCY
SERVICE AREA AND KERN COUNTY

Year:	Service Area--Urban		Service Area--Rural		Total in	Kern County
:	Bakersfield:	Other	Farm	Nonfarm	Service Area:	Total
1930						83,000
1940						135,000
1950	123,000	13,671	34,036	6,164	176,871	228,000
1960	141,763	16,586	31,896	4,903	195,148	292,000
1970	199,000	24,000	40,000	13,000	276,000	385,000
1980	254,000	31,000	46,000	22,000	353,000	480,000
1990	339,000	43,000	52,000	30,000	464,000	620,000

Agricultural Development

Virtually all of the farmed land in the service area is irrigated. According to a detailed land use survey made by the department in 1958, there were 348,700 acres of land being irrigated in the service area and only about 8,000 acres were dry-farmed. Most of the dry-farmed lands were devoted to barley and wheat. In the entire San Joaquin Valley portion of the county in 1958 there were 592,000 acres under irrigation. In 1960 there were 687,700 acres of farmed land in all of Kern County with a total value of agricultural products amounting to \$246,998,000¹/_.

¹/ _{Kern County Agricultural Commissioner's Report.}

The historical growth of farm acreage in Kern County is shown in Table 2.

TABLE 2
FARM ACREAGE IN KERN COUNTY

Year	:	Acreage
1925	:	117,500
1930	:	169,300
1935	:	189,800
1940	:	358,600
1945	:	396,600
1950	:	542,900
1955	:	660,600
1960	:	687,700

Statistics in 1960 indicate that total employment in Kern County was about 100,000 of which about 25 percent was in farm work, in the processing of agricultural products, or in agricultural services. In addition to employment in activities directly associated with agriculture, jobs were supported by agriculture in other fields such as retail and wholesale trade, government service, utilities, and construction. Agriculture accounts for more employment than any other enterprise in the county.

Industrial Development

Mining and Processing

The total value of mineral production in Kern County in 1959 was \$351,594,000. The county is the leading producer of petroleum and natural gas products in California, which in 1959 accounted for approximately 82 percent of the total mineral

production of the county. The production of boron, cement, stone, sand, and gravel accounted for most of the remainder.

Manufacturing

About 7 percent of the people employed in Kern County in 1960 worked in manufacturing industries. Approximately 30 percent of those were employed in work connected with the processing of minerals, and 20 percent were employed in food and fiber processing. The balance of industrial employment was associated with the manufacture of a wide assortment of products by about 140 firms. Many new industries have located in the county in recent years. Industry is expected to assume an increasingly important position in the county's economy.

CHAPTER III. POTENTIAL AGRICULTURAL WATER DEMAND

Presented in this chapter are discussions of the factors affecting agricultural water demand and an estimate of the potential agricultural water demand in the Kern County Water Agency Service Area based on a consideration of classification of lands, unit water use, and market demand, but disregarding the cost and availability of water. The latter are considered in Chapters V and VI.

Presented first are land classification data, estimates of unit use of applied water, and a discussion of market outlook. These are followed by a determination of the potential requirement for water and an analysis of the present water supply. The chapter is concluded with a determination of the potential requirement for imported water for agricultural purposes calculated as the difference between the potential requirement and the present water supply.

Agricultural Water Demand Factors^{1/}

Classification of Lands

A land classification survey was conducted by the Department of Water Resources in the San Joaquin Valley during the period 1956-61. Table 3 "Classification of Irrigable Lands in Kern County Water Agency Service Area" is based on data obtained from that survey.

^{1/} For additional information see "Appendix to Final Report, General Evaluation of the Proposed Program for Financing and Constructing the State Water Resources Development System of the State of California, Department of Water Resources", October 1960, by Chas. T. Main, Inc.

TABLE 3

CLASSIFICATION OF IRRIGABLE LANDS
IN KERN COUNTY WATER AGENCY SERVICE AREA
(In acres)

Potential Member Units	Valley Lands: Valley Lands:				
	: of Excellent:	: of Medium :	: of Poor :	: Sloping :	: Total
	: Quality1/ :	: Quality2/ :	: Quality3/ :	: Lands4/ :	
Antelope Plain W.D.5/	36,000		4,000		40,000
Belridge W. S. D.	64,200	1,600	14,000	4,200	84,000
Lost Hills W.D.5/	26,600	20,400	14,700	1,300	63,000
Rosedale-Rio Bravo W.S.D.	20,000	4,000	18,900		42,900
Semitropic W. S.D.	57,700	1,900	163,200		222,800
Taft Agriculture	8,800	2,000	2,000	1,300	14,100
Wheeler Ridge-Maricopa W.S.D.					
Area No. 1	66,700	4,700		100	71,500
Area No. 2	20,200	26,100		4,000	50,300
Kern River Delta & Others	118,000	89,800	94,000	300	302,100
Totals	418,200	150,500	310,800	11,200	890,700

1/ Lands classified as V and Vs.

2/ Lands classified as Vl, Vh, Vls, and Vhs.

3/ Valley lands suitable for shallow rooted crops and all valley lands requiring moderate to heavy amounts of amendments.

4/ Lands classified as H.

5/ Approximate.

Note: For definitions of land classification symbols see "Report on Proposed Belridge Water Storage District, Kern County", December 1961.

Unit Use of Applied Agricultural Water

Unit use of applied water for crops grown in Kern County is tabulated in Table 4.

TABLE 4

UNIT USE OF APPLIED WATER FOR CROPS GROWN IN KERN COUNTY WATER AGENCY SERVICE AREA

Crop	: Acre-feet of Water : per acre of : Irrigated Land
Alfalfa	3.9
Alfalfa Seed	3.2
Citrus	2.9
Cotton	3.8
Deciduous orchard	2.9
Grain	1.1
Grapes	3.1
Miscellaneous field	2.0
Pasture	4.1
Potatoes	3.0
Truck crops	2.0

Market Outlook

In an office study entitled "Market Outlook for Selected California Crops, 1960-2020", the department estimated future demand for farm products grown in California. From that study the Agency's share of the total California 1990 market for farm crops grown in the Agency's service area has been determined. This determination took into consideration the historical shifts in the production of crops among different producing areas in California. The historical regional crop production shifts for the past 40 years were plotted and projected to the year 1990.

Tentative Crop Projection

From the market outlook and estimated projected 1990 crop yields, the acreage necessary to supply the market demand was determined. This method of projecting crop acreage was utilized for all major crops grown in the service area. In this determination of tentative crop projection, availability and cost of water were not considered. The 1990 projected cropping patterns in the Kern County Water Agency Service Area based on consideration of soils and market outlook are shown in Table 5.

Potential Agricultural Water Requirement

If only the physical factors of agricultural water demand and the market outlook are considered, there will be a requirement of about 2.1 million acre-feet in the Kern County Water Agency Service Area in 1990. The determination of this quantity is based on a consideration of the previously described water demand factors, but disregards availability of water and the economic factor of water cost. The latter two factors are considered in Chapters V and VI. The potential agricultural water requirement of potential member units of the Agency is set forth in Table 6.

TABLE 5

PROJECTED CROPPING PATTERNS
IN KERN COUNTY WATER AGENCY SERVICE AREA IN 1990
BASED ON CONSIDERATION OF SOILS AND MARKET OUTLOOK
(In acres)

Crops	: Antelope:	Bel-:	Lost:	Rosedale-:	Semi-:	: Taft Agri-:	Wheeler Ridge-:	Kern River:
	: Plain:	ridge:	Hills:	RioBravo:	tropic:	W.S.D.:	Maricopa W.S.D.:	Delta and:
	: W.D.:	: W.S.D.:	W.D.:	: W.S.D.:	: W.S.D.:	: culture/:	Area #1:	Area #2:
	: Others:	: Others:	: Others:	: Others:	: Others:	: Others:	: Others:	: Others:
Orchard	4,300	10,000	4,000	500	5,200	9,500	4,100	37,600
Grapes	2,900	7,000	2,700	400	2,300	7,200	3,600	29,100
Cotton	7,400	23,000	18,000	12,000	48,000	17,000	8,800	93,000
Misc. Truck	500	1,300	500	900	1,800	3,800	700	5,000
Potatoes				3,000		2,700	200	5,000
Misc. Field ^{2/}	3,700	8,700	4,800	4,500	16,000	8,800	4,300	27,000
Alfalfa hay & seed	3,000	7,700	4,800	8,200	28,000	600	6,700	57,000
Pasture	100	3,300	7,100	800	11,000			12,000
Small Grain	2,000	6,600	6,500	3,200	22,500	400	500	38,000
Totals	23,900	67,600	48,400	30,500	130,300	10,700	28,900	240,000

1/ Formerly called Taft No. 1.
2/ Includes sugar beets.

TABLE 6

POTENTIAL REQUIREMENT FOR AGRICULTURAL WATER
IN KERN COUNTY WATER AGENCY SERVICE AREA IN 1990
BASED ON CONSIDERATION OF SOILS AND MARKET OUTLOOK 1/

Potential Member Unit	:	Acre-feet
Antelope Plain Water District		81,000
Belridge Water Storage District		230,000
Lost Hills Water District		165,000
Rosedale-Rio Bravo Water Storage District		104,000
Semitropic Water Storage District		430,000
Taft Agriculture		34,000
Wheeler Ridge-Maricopa Water Storage District		
Area No. 1	197,000	
Area No. 2	<u>98,000</u>	
		295,000
Kern River Delta and Others		<u>800,000</u>
	Total	2,139,000

1/ Includes double cropping water requirements.

Present Water Supply

Surface Water Supply

The only major stream in the Kern County Water Agency Service Area is the Kern River. Kern River water is diverted for irrigation use, mostly in the Kern River Delta area. Flow of minor streams is too erratic for direct diversion, although water from these streams contributes substantially to the area's ground water supply.

Ground Water Conditions

The San Joaquin Valley is underlain by virtually a single ground water basin. Water is being pumped from this basin in increasing amounts each year in order to supply the irrigation, domestic, municipal, and industrial water needs of the valley. It is estimated that the basin supplies about 50 percent of the total water requirements of the valley and that a total for the entire valley of more than 9 million acre-feet is pumped annually. As a result of this pumping an overdraft condition exists in most of the valley, and ground water levels are dropping continuously.

Estimates vary of the annual overdraft of ground water in the Kern County portion of the San Joaquin Valley. The department's latest studies indicate that during the decade 1960-70 the overdraft in this area will average about 700,000 acre-feet annually.

Water Conditions in Potential Member Units

Belridge Water Storage District and Antelope Plain and Lost Hills Water Districts. There is no usable surface water supply in these three districts except for sporadic flood flows. These districts are relatively undeveloped and have generally similar ground water conditions. There are no commercially irrigated lands in the Belridge Water Storage District. A few thousand acres are irrigated by ground water in the Antelope Plain Water District, and about 10,000 acres x

are irrigated in the Lost Hills Water District from ground water and occasional surface water from the Kern River.

The yields of existing wells are for the most part low, and the quality of ground water is poor. Crops produced on these lands are limited to those which are tolerant to poor quality water. Any significant additional development of these districts is dependent upon an imported water supply.

Ordinarily, in an area having ground water, there is the opportunity to make efficient use of imported water supplies by re-using that portion of the water which percolates beyond the crop root zone to the underlying ground water basin. In these districts, however, the material underlying the surface is very dry, and it is believed that virtually all percolating water would be absorbed for several decades.

In these districts the existing poor quality of ground water provides an additional problem. Even the percolation of additional water will not improve these waters to the point where they could be used without mixing with surface supplies. It seems highly doubtful, however, that this would have any appreciable effect prior to 1990.

Rosedale-Rio Bravo Water Storage District. This district is primarily dependent upon ground water for its irrigation water supply, but facilities were recently constructed which enable the district to obtain surplus Central Valley Project water from the Friant-Kern Canal. During the

spring of 1962 approximately 9,000 acre-feet of such water were acquired and used to recharge the ground water supply. The Friant-Kern supply is not expected to be available after 1977.

Although pumping lifts are relatively small in the district, the ground water levels in wells have been falling rapidly. Between fall 1954 and fall 1960 the levels dropped an average of about 9 feet per year. This drop was caused by pumping in the surrounding area as well as in the district. As the water levels continue to recede, a point will be reached beyond which it will be more economical to buy imported project water than to pump ground water. Imported water is needed therefore to replace ground water pumping as well as to replace the Central Valley Project supply.

Semitropic Water Storage District. This district has a minor surface water supply and is otherwise dependent upon ground water. Ground water pumping lifts are relatively small, but water levels are dropping at a rapid and continuing rate. As in the Rosedale-Rio Bravo district, it will become economical to purchase imported project water as the pumping lifts increase. In addition, the ground water quality under certain portions of the district is poor, and such areas have an immediate need for imported project water. Elsewhere the ground water quality is generally good except that it has a high percent sodium. The use of such water for irrigation of the high sodium soils which exist throughout the district

results in degradation of the physical and chemical structure of the soil. The use of soil amendments is required in order to maintain the productivity of the soils. Use of imported project water will probably not require the periodic use of such soil amendments on reclaimed soils.

West Kern County Water District. This area contains relatively few wells and the limited data available indicate the quality to be generally poor. Some of this water is being used for irrigation, and it is possible that the irrigated acreage could be expanded somewhat through additional use of the local ground water supply. Only the most salt tolerant crops, however, could be grown. It seems unlikely that any significant increase in the irrigated acreage will take place until a supplemental water supply becomes available. With the exception of the portion of the district immediately west of Buena Vista Lake bed, wells are deep and costly and have relatively high lifts.

Much of the material underlying this area is very dry; and as in the Belridge-Antelope Plain-Lost Hills area, it is believed that little percolate of imported irrigation water would reach the ground water basin for several decades after the start of importation of water.

Wheeler Ridge-Maricopa Water Storage District. This district is almost solely dependent on ground water for an irrigation supply. There is an extremely heavy ground water overdraft in the area and the water levels have been dropping

at a rapid rate. The water supply problem in this area is one of the most critical in the county. Water in the area is obtained from deep pressure aquifers. The wells are extremely costly to drill. Some operators report that they have reached the maximum economic depth of pumping at this time.

Because of the very dry nature of the materials underlying the surface of a large portion of this district, as in the Belridge-Antelope Plain-Lost Hills area, it is unlikely that an appreciable amount of percolation from applied irrigation water will be available for re-use for several decades.

Water quality in the eastern portion of this district is generally good, but the quality becomes progressively poor toward the west. This fact alone is sufficient to indicate that development in the western portion of the district will not expand without an imported supply.

Tehachapi-Cummings Water Conservation District and Tejon Ranch Headquarters Area. These areas are located so that water from the State Water Project will be too costly to use as a supplemental irrigation supply. The relatively small amount of water which these entities have requested will probably be used for domestic and industrial purposes.

Kern River Delta, Bakersfield Urban, and Others. This portion of the service area is the only part having a substantial supply of surface water. Despite this, however,

extensive ground water pumping is conducted and the ground water levels are dropping due to overdraft of the ground water supply. Supplemental water is needed therefore to bring about a balance between supply and demand.

Safe Yield of Local Water Supplies

The safe yield of the existing local surface and ground water supply available to the Kern County Water Agency Service Area is estimated to be on the order of 500,000 acre-feet annually. This estimate is based on the average annual supply and is that amount which could be consumed annually for an indefinitely long period of years.

Potential Requirement for Imported Water

By deducting the estimated safe yield of the present water supply from the previously determined potential requirement for agricultural water, the potential requirement for imported water is determined to be about 1.6 million acre-feet annually. If the 1990 urban demands, which are discussed in Chapter V, are added the total is about 1.7 million acre-feet. This is the amount of water which would be required as an import to the Kern County Water Agency Service Area if water cost were not a factor. As is indicated in the first chapter, however, only a total of about 1.5 million acre-feet of water is available to the San Joaquin Valley from the State Water Project. Moreover, as is shown in the analysis presented in Chapters V and VI, the amount of water which Kern County Water Agency can contract for at this time is further limited by the capacity of the Agency to pay for water.

CHAPTER IV. COST OF WATER SERVICE FROM THE STATE WATER PROJECT

The cost to the Kern County Water Agency of water service from the State Water Project is dependent upon the allocation to the Agency of costs of the project facilities for conservation and transportation plus the cost of local conveyance systems for distribution of water. The State Water Project will be constructed by the State with funds derived from the sale of general obligation bonds, authorized under the Water Resources Development Bond Act of 1960, and from the California Water Fund. Local conveyance systems will be constructed and financed by the Agency or its member units.

The contract executed on November 4, 1960, between the State and The Metropolitan Water District of Southern California is, with its possible amendments, the department's prototype water supply contract. The department's publication "Standard Provisions for Water Supply Contract", approved August 3, 1962, is based on the prototype contract.

The standard provisions set forth the terms which will be generally applicable to all contracts, and establish the mutual obligations of the State and the water supply contractors. The State's essential obligation is to make available for delivery to the contracting agency, at its delivery structures, designated amounts of project water each year, commencing with the year of initial water delivery and continuing through the life of the contract. The essential

obligation of the contracting agency is to make all payments required under the contract, including payment for the conservation works and for the transportation facilities necessary to deliver water to it.

Every contractor for project water will pay an annual amount per acre-foot of water, designated as the Delta Water Charge. Together with revenues derived from power generated in connection with the operation of project conservation facilities, this charge will return to the State all reimbursable costs of the conservation facilities over the project repayment period.

A surcharge representing the power credit per acre-foot of water will be charged for project water put to agricultural or manufacturing use on excess land. This surcharge is provided for in Article 30 of the standard provisions, and is established as \$2 per acre-foot until all of the facilities for generation of electrical energy in connection with the operation of initial project conservation facilities are installed and in operation. Each year thereafter the State shall redetermine the power credit per acre-foot of water. Excess land is defined as that part of any land in excess of 160 acres in single beneficial ownership, or 320 acres in joint ownership by husband and wife.

In addition to the Delta Water Charge, and the surcharge where applicable, contractors receiving water from the State Water Project will pay for the construction and operation

of the transportation facilities. Articles 23 through 28 of the standard provisions govern the determination of the transportation charges.

The allocation of the costs to each contractor of construction and operation of the transportation facilities is made on a proportionate use of facilities basis. The construction costs and the minimum or fixed operation, maintenance, power, and replacement costs are allocated on the basis of the maximum annual entitlement and peaking capacity provided for the agency within each reach of the aqueduct which would be used to convey water to the agency. The variable operation, maintenance power, and replacement costs are allocated on the basis of the relative amount of water to be delivered to the agency each year through each reach of the aqueduct.

State Water Project

The project transportation facilities that would be used to provide water to the Kern County Water Agency are the portions of the California Aqueduct from the Sacramento-San Joaquin Delta to the Tehachapi Mountains and about 12 miles of the Coastal Aqueduct. The California Aqueduct enters Kern County at the Kings County line at an elevation of about 310 feet. Its location is shown on Plate 2. From the Kings-Kern County line the route of the aqueduct is southeasterly past Lost Hills and Tupman and around the west side of Buena Vista Lake to Buena Vista Pumping Plant located about 6 miles east of Taft.

The pump lift at this plant will be about 220 feet. The aqueduct then will follow a route approximately along the 500-foot contour across Maricopa Flats to Wheeler Ridge. Wheeler Ridge Pumping Plants I and II will be located 2.2 miles apart on Wheeler Ridge. Together they will lift the water to an elevation of 1,240 feet. From Wheeler Ridge Pumping Plant II the aqueduct route extends southeasterly to the Tehachapi Pumping Plant near Pastoria Creek. This plant will lift the water up the face of the Tehachapi Mountains to an elevation of 3,168 feet near the north portal of the Tehachapi Tunnel No. 1. Delivery of water would be made at this elevation to the Tejon Ranch headquarters area, the southernmost potential member unit.

The potential member units of the Agency are favorably situated to receive water from the California Aqueduct. Many of the units are located adjacent to the aqueduct and have large portions of their service areas at elevations below the aqueduct.

Cost of Facilities

The total transportation capital cost allocated to the Kern County Water Agency is estimated to be \$104,397,000 for a maximum annual entitlement of 1,000,000 acre-feet as developed in Chapter V. This allocated cost is based on the assumed deliveries of the Agency's maximum annual entitlement to potential member units as shown in Table 11, "Demand Buildup and Maximum Annual entitlements for Potential Members Units, Kern County Water Agency". Of this cost, \$91,859,000 is allocated

to the 858,000 acre-feet of water to be delivered to agricultural water users at a maximum monthly peaking rate of 18 percent of the maximum annual entitlement. The remaining \$12,538,000 is allocated to the 142,000 acre-feet to be delivered to municipal and industrial users at a maximum monthly peaking rate of 11 percent. These costs are allocated between agricultural and municipal and industrial users by utilizing the average of the maximum annual entitlement and peaking capacity provided for each use.

For purposes of comparison, an equivalent unit rate for delivering 1,000,000 acre-feet to the Agency has been computed. The equivalent unit rate is defined as that constant charge which, when assessed against each acre-foot of delivery during the entire repayment period, will produce a sum by the end of the period equivalent to the annual charges which would have been assessed under a water supply contract, together with interest computed at the project interest rate. The project interest rate is assumed to be 4 percent per annum. The total estimated equivalent unit rate for service of annual entitlements to the Agency under the above-mentioned assumptions is \$20.42 per acre-foot for agricultural water, and \$20.18 per acre-foot for municipal and industrial water. The combined equivalent unit rate is \$20.39.

Tables 7 and 8 summarize the annual charges to Kern County Water Agency for agricultural and for municipal and industrial water deliveries, respectively. The component costs are further described as follows:

Delta Water Charge. The Delta Water Charge is established at a rate of \$3.50 per acre-foot through the year 1969 and is estimated to be \$5.46 per acre-foot for the period 1970 through 1977 and \$7.34 per acre-foot thereafter until supplemental water supplies, as defined in the standard provisions, are provided.

Transportation Charge. Under Article 24(c) of the standard provisions, the construction or capital cost component of the Transportation Charge allocated each year to a contractor must be paid in 50 equal annual payments of principal and interest. Annual charges to the Agency for municipal and industrial water are based on this method of payment.

Article 45 of the prototype contract, however, provides for modified payments by agricultural contractors. In this report it is assumed that agricultural water deliveries would be paid for at a unit rate per acre foot equal to the equivalent unit rate for this component. This unit rate is estimated to be \$7.32 per acre-foot. Payment at this rate commencing in the initial year of water delivery will repay all principal, with compound interest, of capital costs allocated to agricultural use within the project repayment period.

The minimum and variable operation, maintenance, power, and replacement components of the Transportation Charge for agricultural and for municipal and industrial deliveries are shown in Tables 7 and 8, respectively.

TABLE 7
SUMMARY OF ANNUAL CHARGES TO KERN COUNTY WATER AGENCY
FOR AGRICULTURAL WATER FROM THE STATE WATER PROJECT

(In dollars unless otherwise noted)

Calendar Year	ANNUAL ENTITLEMENTS In acre-feet (Table A)	ALLOCATED TRANS- PORTATION CAPITAL COSTS (Table C)	TRANSPORTATION CHARGE					DELTA WATER CHARGE	TOTAL WATER CHARGES	
			Capital Cost Component (Table D)			Minimum OMP & R Component (Tables E&G)	Variable OMP & R Component (Tables F&G)			Total Trans- portation Charge (Table G)
			Annual Principal Payment	Annual Interest Payment	Total Annual Payment (Table G)					
1960	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0
1964	0	18801395	0	0	0	0	0	0	0	0
1965	0	19015848	0	0	0	0	0	0	0	0
1966	0	23999746	0	0	0	0	0	0	0	0
1967	0	19583427	0	0	0	0	0	0	0	0
1968	87000	2433355	0	637138	637138	75673	555224	75673	304500	1973695
1969	95700	1147796	0	700852	700852	570081	504299	1775232	334950	2110182
1970	131100	3232566	0	960102	960102	643505	626134	2229741	715938	2945679
1971	142600	1528396	0	1044321	1044321	764750	564773	2373844	778739	3152583
1972	203400	219848	0	1489586	1489586	891354	900134	3281073	1110769	4391842
1973	231200	311835	0	1693177	1693177	993389	1002970	3589536	1262584	4852120
1974	255900	118123	0	1874066	1874066	901146	1106458	3881720	1397471	5279191
1975	283500	1016483	0	2076192	2076192	922701	1217777	4216670	1548195	5764865
1976	318800	93312	0	2334710	2334710	931800	1428059	4694569	1740969	6435538
1977	358800	204993	0	2627647	2627647	931027	1603897	5162571	1959409	7121980
1978	397900	79680	0	2913993	2913993	936471	1826381	5676845	2920528	8597373
1979	435700	0	0	3190818	3190818	937363	1996907	6125088	3197974	9323062
1980	476000	0	0	3485953	3485953	976918	2244095	6706966	3493771	10200737
1981	517400	0	0	3789143	3789143	977803	2460690	7227636	3797641	11025277
1982	554700	0	0	4062307	4062307	982182	2708161	7753850	4071417	11825267
1983	597700	0	0	4377214	4377214	983922	2927402	8288538	4387031	12675569
1984	637700	0	0	4670151	4670151	984820	3152591	8807562	4680625	13488187
1985	676500	282599	0	4954300	4954300	985574	3359659	9299533	4965411	14264944
1986	714200	0	0	5230394	5230394	961011	3592702	9384107	5242124	14626231
1987	754000	0	0	5521866	5521866	958500	3849564	9830380	5534250	15364630
1988	794900	0	0	5821395	5821395	956544	4078702	10278702	5834450	16113152
1989	824800	0	0	6040365	6040365	954135	4283832	10578332	6053912	16632244
1990	858000	0	0	6283503	6283503	952282	4490683	10926468	6297595	17224063
1991	858000	0	0	6283503	6283503	950595	469214	10893312	6297595	17190907
1992	858000	0	0	6283503	6283503	950515	4892374	10892374	6297595	17189969
1993	858000	0	0	6283503	6283503	950413	5094698	10889698	6297595	17187293
1994	858000	0	0	6283503	6283503	950346	5294924	10888773	6297595	17186368
1995	858000	0	0	6283503	6283503	950266	5492608	10886977	6297595	17184572
1996	858000	0	0	6283503	6283503	950204	5692350	10886062	6297595	17183657
1997	858000	0	0	6283503	6283503	950144	5891492	10885136	6297595	17182731
1998	858000	0	0	6283503	6283503	950107	6090634	10884244	6297595	17181839
1999	858000	0	0	6283503	6283503	950085	6290634	10884222	6297595	17181817
2000	858000	0	0	6283503	6283503	950085	6490634	10884222	6297595	17181817
2001	858000	0	0	6283503	6283503	950085	6690634	10884222	6297595	17181817
2002	858000	0	0	6283503	6283503	950085	6890634	10884222	6297595	17181817
2003	858000	0	0	6283503	6283503	950085	7090634	10884222	6297595	17181817
2004	858000	0	0	6283503	6283503	950085	7290634	10884222	6297595	17181817
2005	858000	0	0	6283503	6283503	950085	7490634	10884222	6297595	17181817
2006	858000	0	0	6283503	6283503	950085	7690634	10884222	6297595	17181817
2007	858000	0	0	6283503	6283503	950085	7890634	10884222	6297595	17181817
2008	858000	0	0	6283503	6283503	950085	8090634	10884222	6297595	17181817
2009	858000	0	0	6283503	6283503	950085	8290634	10884222	6297595	17181817
2010	858000	0	0	6283503	6283503	950085	8490634	10884222	6297595	17181817
2011	858000	0	0	6283503	6283503	950085	8690634	10884222	6297595	17181817
2012	858000	0	0	6283503	6283503	950085	8890634	10884222	6297595	17181817
2013	858000	0	0	1055790	5227713	6283503	950085	10884222	6297595	17181817
2014	858000	0	0	2651359	3632144	6283503	950085	10884222	6297595	17181817
2015	858000	0	0	2757413	3526090	6283503	950085	10884222	6297595	17181817
2016	858000	0	0	2861709	3415794	6283503	950085	10884222	6297595	17181817
2017	858000	0	0	2982418	3301085	6283503	950085	10884222	6297595	17181817
2018	858000	0	0	3101714	3181789	6283503	950085	10884222	6297595	17181817
2019	858000	0	0	3225783	3057720	6283503	950085	10884222	6297595	17181817
2020	858000	0	0	3354813	2928650	6283503	950085	10884222	6297595	17181817
2021	858000	0	0	3489007	2794494	6283503	950085	10884222	6297595	17181817
2022	858000	0	0	3628567	2654936	6283503	950085	10884222	6297595	17181817
2023	858000	0	0	3773710	2509793	6283503	950085	10884222	6297595	17181817
2024	858000	0	0	3924658	2358845	6283503	950085	10884222	6297595	17181817
2025	858000	0	0	4081643	2201860	6283503	950085	10884222	6297595	17181817
2026	858000	0	0	4244910	2038593	6283503	950085	10884222	6297595	17181817
2027	858000	0	0	4414705	1868798	6283503	950085	10884222	6297595	17181817
2028	858000	0	0	4591295	1692208	6283503	950085	10884222	6297595	17181817
2029	858000	0	0	4774945	1505558	6283503	950085	10884222	6297595	17181817
2030	858000	0	0	4965943	1317560	6283503	950085	10884222	6297595	17181817
2031	858000	0	0	5164587	1118921	6283503	950085	10884222	6297595	17181817
2032	858000	0	0	5371165	912338	6283503	950085	10884222	6297595	17181817
2033	858000	0	0	5586012	697491	6283503	950085	10884222	6297595	17181817
2034	858000	0	0	5809452	474051	6283503	950085	10884222	6297595	17181817
2035	858000	0	0	6041829	241674	6283503	950085	10884222	6297595	17181817
TOTALS	48957500	91859422	91859422	266677406	358536828	63306220	211817573	633656621	355022028	988678649
EQUIVALENT UNIT RATES				7.42	1.41	4.41	13.34		7.08	20.42

NOTES: a. Based on estimated costs of the project as of May 1963.
b. The Delta Water Charge represents the product of the annual entitlement times \$3.50 per acre-foot through the year 1969, \$5.46 for the years 1970-1977, inclusive, and \$7.34 thereafter.
c. Table nomenclature as shown in the "Standard Provisions for Water Supply Contract", approved August 3, 1962.

TABLE 8
SUMMARY OF ANNUAL CHARGES TO KERN COUNTY WATER AGENCY
FOR MUNICIPAL AND INDUSTRIAL WATER FROM THE STATE WATER PROJECT

(In dollars unless otherwise noted)

Calendar Year	ANNUAL ENTITLEMENTS In acre-feet (Table A)	ALLOCATED TRANS- PORTATION CAPITAL COSTS (Table C)	TRANSPORTATION CHARGE					DELTA WATER CHARGE	TOTAL WATER CHARGES	
			Capital Cost Component (Table D)			Minimum OMF & R Component (Tables E&G)	Variable OMF & R Component (Tables E&G)			Total Trans- portation Charge (Table G)
			Annual Principal Payment	Annual Interest Payment	Total Annual Payment (Table G)					
1960	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0
1964	0	2438426	0	0	0	0	0	0	0	0
1965	0	2401596	15974	97535	113509	0	0	113509	0	113509
1966	0	3022581	32344	192960	225304	0	0	225304	0	225304
1967	0	2752329	53438	312568	366006	9625	0	375631	0	375631
1968	0	381611	73603	420524	494127	59651	0	553778	0	553778
1969	0	245098	79047	432844	511891	70261	0	582152	0	582152
1970	14000	588942	83820	439480	523300	78564	61894	663758	76454	740212
1971	17000	197200	91031	459684	550715	96126	62577	709418	92837	802255
1972	28900	42352	95961	463934	559895	113943	150356	824194	157823	982017
1973	33300	64850	100077	461789	561866	114253	167076	843195	181851	1025046
1974	37400	45915	104507	460378	564885	115319	200402	880606	204242	1084848
1975	40600	165451	108989	458033	567022	118682	214240	899944	221717	1121661
1976	45000	23686	114431	460293	574724	119831	242208	936853	245745	1182598
1977	48100	34209	119164	456663	575827	119716	256104	951647	262674	1214321
1978	52000	97892	124157	453262	577419	120352	293361	991132	381672	1372804
1979	56200	0	129761	452215	581976	120451	310821	1013248	412500	1425748
1980	58800	0	134954	447022	581976	125542	342555	1050080	431583	1481663
1981	66600	0	140351	441625	581976	125897	386099	1093972	488834	1582806
1982	75500	0	145960	436016	581976	126839	440928	1149743	554159	1703902
1983	84700	0	151799	430177	581976	126891	504941	1213808	621686	1835494
1984	92500	0	157870	424106	581976	127038	568178	1257252	678937	1936189
1985	100400	35942	164181	417795	581976	127432	593434	1302842	736921	2039763
1986	108300	0	170985	412664	583649	124294	575163	1283106	794006	2078012
1987	116100	0	177827	405822	583649	124195	608504	1316348	852157	2168505
1988	126300	0	184938	398711	583649	123982	672402	1300333	927024	2307057
1989	134100	0	192337	391312	583649	123661	696175	1403485	984274	2387759
1990	142000	0	200028	383621	583649	123562	727803	1435014	1042259	2477273
1991	142000	0	208025	375624	583649	123301	720719	1427669	1042259	2469928
1992	142000	0	216350	367299	583649	123291	720577	1427517	1042259	2469776
1993	142000	0	225002	358647	583649	123278	720151	1427078	1042259	2469337
1994	142000	0	234001	349648	583649	123260	720009	1426927	1042259	2469186
1995	142000	0	243358	340291	583649	123259	719725	1426633	1042259	2468892
1996	142000	0	253090	330559	583649	123252	719583	1426484	1042259	2468743
1997	142000	0	263217	320432	583649	123244	719441	1426334	1042259	2468593
1998	142000	0	273742	309907	583649	123239	719299	1426187	1042259	2468446
1999	142000	0	284695	298954	583649	123236	719299	1426184	1042259	2468443
2000	142000	0	296076	287573	583649	123236	719299	1426184	1042259	2468443
2001	142000	0	307912	275737	583649	123236	719299	1426184	1042259	2468443
2002	142000	0	320232	263417	583649	123236	719299	1426184	1042259	2468443
2003	142000	0	333044	250605	583649	123236	719299	1426184	1042259	2468443
2004	142000	0	346364	237285	583649	123236	719299	1426184	1042259	2468443
2005	142000	0	360216	223433	583649	123236	719299	1426184	1042259	2468443
2006	142000	0	374622	209027	583649	123236	719299	1426184	1042259	2468443
2007	142000	0	389608	194041	583649	123236	719299	1426184	1042259	2468443
2008	142000	0	405190	178459	583649	123236	719299	1426184	1042259	2468443
2009	142000	0	421400	162249	583649	123236	719299	1426184	1042259	2468443
2010	142000	0	438248	145401	583649	123236	719299	1426184	1042259	2468443
2011	142000	0	455779	127870	583649	123236	719299	1426184	1042259	2468443
2012	142000	0	474013	109636	583649	123236	719299	1426184	1042259	2468443
2013	142000	0	492970	90679	583649	123236	719299	1426184	1042259	2468443
2014	142000	0	512688	70961	583649	123236	719299	1426184	1042259	2468443
2015	142000	0	534961	50449	583649	123236	719299	1312675	1042259	2354934
2016	142000	0	558882	33663	583649	123236	719299	1200880	1042259	2243139
2017	142000	0	584969	20674	583649	123236	719299	1060107	1042259	2102437
2018	142000	0	612724	12798	583649	123236	719299	932057	1042259	1974316
2019	142000	0	642029	9729	583649	123236	719299	814293	1042259	1956552
2020	142000	0	673104	7245	583649	123236	719299	702884	1042259	1945143
2021	142000	0	705819	5115	583649	123236	719299	595469	1042259	1911728
2022	142000	0	740174	3007	583649	123236	719299	486289	1042259	1908548
2023	142000	0	776179	967	583649	123236	719299	386438	1042259	1906577
2024	142000	0	813834	2464	583649	123236	719299	2861299	1042259	1903558
2025	142000	0	853148	1809	583649	123236	719299	1859162	1042259	1901421
2026	142000	0	894124	1215	583649	123236	719299	851460	1042259	1899379
2027	142000	0	936913	909	583649	123236	719299	750357	1042259	1897216
2028	142000	0	981054	629	583649	123236	719299	648765	1042259	1895053
2029	142000	0	1027009	403	583649	123236	719299	547173	1042259	1892890
2030	142000	0	1075564	1320	583649	123236	719299	445581	1042259	1890727
2031	142000	0	1126719	301	583649	123236	719299	344089	1042259	1888564
2032	142000	0	1180474	245	583649	123236	719299	242597	1042259	1886401
2033	142000	0	1236829	189	583649	123236	719299	141105	1042259	1884238
2034	142000	0	1295784	130	583649	123236	719299	40013	1042259	1882075
2035	142000	0	1357339	67	583649	123236	719299	0	1042259	1879912
TOTALS	7867800	12538080	12538080	16644370	29182450	8182039	40428878	77793367	57251910	135045277
EQUIVALENT UNIT RATES					6.46	1.35	5.22	13.03	7.15	20.18

NOTES: a. Based on estimated costs of the project as of May 1963.

b. The Delta Water Charge represents the product of the annual entitlement times \$3.50 per acre-foot through the year 1969, \$5.46 for the years 1970-1977, inclusive, and \$7.34 thereafter.

c. Table nomenclature as shown in the "Standard Provisions for Water Supply Contract", approved August 3, 1962.

Cost of Surplus Water

The standard provisions provide that the charge for surplus water shall be at least equal to the variable operation, maintenance, and power costs incurred in service of such water. This would include variable charges for both the conservation and transportation facilities. Under the provisions of the contract amendments recently proposed to present contractors, this amount would be the total charge for surplus water.

The unit rates for surplus water in Kern County, based on the proposed amendments, are estimated to average \$4.39 per acre-foot north of the Buena Vista Pumping Plant and \$5.85 between Buena Vista Pumping Plant and Wheeler Ridge Pumping Plant I.

Local Distribution Systems

Distribution systems must be constructed to convey water from the State Water Project to the areas of use. In certain areas this involves only the improvement or expansion of existing distribution systems, while in others it involves the construction of complete systems. Most of the potential member units will require new distribution systems.

Cost estimates have been prepared for construction and operation of distribution systems for each of the potential member units. For purposes of these estimates the assumed distribution of the maximum annual entitlement and the demand buildup presented in Table 11 have been utilized. The estimates are necessarily based on tentative assumptions as to areas of use within the member units.

Design Criteria for Irrigation Distribution Systems

Irrigation distribution systems have been assumed to provide capacity to divert and distribute 18 percent of each potential member unit's share of the Agency's maximum annual entitlement in a one-month period. Sufficient laterals have been provided so that each 160-acre parcel assumed to be irrigated by each system would have a turnout.

It has been assumed that lands below the aqueduct would be served entirely by gravity systems consisting of concrete-lined canals or reinforced concrete pipe. Lands above the aqueduct would have similar gravity systems but water would be supplied to each by pumping. Consideration has been given to facilities for cross drainage, access, and road crossings. Within the Wheeler Ridge-Maricopa and Belridge Water Storage Districts and the Antelope Plain and Lost Hills Water Districts, shallow subsidence has been taken into consideration.

Design Criteria for Urban Distribution Systems

Urban distribution systems have been designed for the conveyance of water from the California Aqueduct to the areas of use. No consideration has been given to the treatment of water or distribution to the individual users. The systems have been designed to deliver 11 percent of each potential member unit's share of the Agency's maximum annual entitlement in a one-month period. All cost estimates have been made on the assumption that deliveries would be through pipelines.

Estimated Cost

Cost estimates of construction and operation of the distribution systems are based on unit cost data adjusted to reflect 1962 prices. Interest is assumed to be 4 percent.

It is assumed that construction of each distribution system would be staged to correspond to the buildup of the member unit's demand plus a share of the available surplus water. Because of the staging, cost estimates are reported on an equivalent unit rate basis to allow a comparison of costs over the repayment period of the project. The estimated equivalent unit rates for cost of construction and operation of distribution systems are shown in Table 9 for potential member units of the Agency.

TABLE 9

ESTIMATED EQUIVALENT UNIT RATES
FOR COST OF LOCAL CONVEYANCE FACILITIES
FOR DISTRIBUTION OF WATER TO POTENTIAL MEMBER UNITS
OF KERN COUNTY WATER AGENCY FROM THE STATE WATER PROJECT

(in dollars per acre-foot unless otherwise noted)

Member Unit	: Share of :		: Operation, :		: Total cost of	
	: Maximum Annual:		: Capital :		: Maintenance, :	
	: Entitlement,:		: Cost :		: Power and :	
	: in acre-feet :		: Replacement :		: Distribution	
Antelope Plain W. D.	40,000	2	5	7		
Bakersfield Urban Area	100,000	5	3	8		
Belridge W.S.D.	170,000	2	5	7		
Kern River Delta Area	113,000	2	4	6		
Lost Hills W.D.	75,000	1	3	4		
Rosedale-Rio Bravo W.S.D.	60,000	3	4	7		
Semitropic W.S.D.	150,000	4	2	6		
Tehachapi-Cummings W.C.D.	6,000	21	54	75		
Tejon Ranch Headquarters Area	5,000	17	17	34		
West Kern County W.D.						
Taft Urban	31,000	3	8	11		
Taft Agriculture	30,000	4	6	10		
Wheeler Ridge-Maricopa W.S.D.						
Area #1	180,000	2	5	7		
Area #2	40,000	3	4	7		
	<u>1,000,000</u>					

CHAPTER V. DEMAND FOR PROJECT WATER

Presented in this chapter are the relevant economic factors and data which are used to determine project water demand, an estimate of the demand, and a determination of the buildup of demand in the Kern County Water Agency Service Area. It will be noted that consideration of these economic factors decreases the estimate of potential requirement for imported water which was developed in Chapter III.

Payment Capacity of Crops

In this report crop payment capacity is defined as the maximum ability of a crop to support the payment for water at the farm headgate over the project repayment period. The appraisal of crop payment capacity per acre-foot of water involves the consideration of crop yields, prices received, crop production costs, and crop irrigation requirement. These factors are briefly discussed in the following paragraphs.

Crop Yields

Crop yields used in this payment capacity analysis are based upon data derived from the Kern County Agricultural Commissioner's annual reports for the 1952-56 period. The yields are projected at a conservative level and are considered attainable by the bulk of the farm operators.

Prices Received

The prices of farm products used in this analysis are essentially the averages of prices received by Kern County farmers during the 1952-56 period. This information was obtained from the annual reports of the Kern County Agricultural Commissioner.

Crop Production Costs

Crop production costs are computed on a per acre basis, using the estimated average unit prices paid during the 1952-56 period for the factors of production, including interest, taxes, and wages. These unit prices are applied to labor and material inputs and farm investment as reported in the crop enterprise studies prepared by the Kern County Agricultural Extension Service. Some adjustments have been made to the reported data to reflect soil and climatic conditions and cultural practices inherent in the potential service areas.

The crop production costs used in the analysis include: (1) all labor and materials used in production, except water; (2) cash overhead, such as taxes, repairs, and general expenses; (3) all interest and depreciation; and (4) management charges.

In addition to the foregoing there is included in the crop production costs an allowance for occasional losses attributable to inclement weather and adverse market conditions.

This allowance also provides for the slightly increased farming cost associated with share or cash rental arrangements as compared with the cost of owner-operation.

Payment Capacity of Undeveloped Lands

Estimated crop production costs, excluding cost of water, for each of the projected crops on a per acre basis have been deducted from the gross income derived from crop yields and prices received to establish the payment capacity per acre of the particular crop. Utilizing the unit use of applied irrigation water presented in Table 4, the payment capacity per acre-foot for each crop has been determined. These values are for undeveloped lands.

Most of the data used in the payment capacity determination have been derived from the department's office report entitled "Supplement to Information and Data on Proposed Program for Financing and Constructing State Water Facilities", dated May 1960.

Payment Capacity of Presently Developed Lands

Without supplemental water the sunk investments of presently irrigated lands receiving water from a receding ground water basin would have diminishing values. For this reason it is assumed that farmers in the Kern County Water Agency Service Area having such a water situation will accept less return for their sunk investment than that estimated by the department for undeveloped lands. Interest charges on

the land development costs of developed lands have been added to the payment capacity. The sunk investment factor tends to raise slightly the effective demand for water.

Agricultural Water Demand

In this report a water demand schedule is defined as a catalogue of quantities of water that will be purchased at various possible prices at a given time. Such a schedule indicates the relationship of demand for water to cost of water. Schedules are presented herein in the form of water cost-demand curves.

The schedules are based on the principle that as the price of water decreases the demand for water rises and, conversely, as the price increases the demand falls. This change in the demand occurs because different crops possess different abilities to pay for water, different lands have different abilities to grow crops, and operators with sunk investments and receding ground water supplies differ from other operators in their willingness to pay for water. Some crops such as citrus, deciduous fruits, grapes, truck, and cotton have greater abilities to pay for water than other lower value crops such as grain, hay, and miscellaneous field crops. Farm operators will normally only grow those crops which as a minimum return all the variable costs of production. Consequently, as the water toll changes, crops are added or deleted from the operation depending upon the direction of the water price movement.

Water Cost-Demand Curve

The payment capacities of the various crops, grown on various land classes and on lands of different stages of development, have been arrayed according to their abilities to pay for project water. From this array of payment capacities and the related water requirements based on the projected cropping pattern, a water demand curve has been established for each potential member unit by cumulatively adding water requirements to irrigate the projected crop acreage. These curves are shown on Plate 3 "Irrigation Water Cost-Demand Curves for Potential Member Units of Kern County Water Agency."

Determination of Agricultural Demand

Utilizing the initial year values of agricultural water tolls presented in Table 12, the cost of local distribution in Table 9, and the water demand curves of Plate 3, the agricultural water demand of the Kern County Water Agency Service Area is determined to be 858,000 acre-feet **for 1990**. The demand by potential member units is shown in **Table 10**.

Urban Water Demand

The 1990 values of urban water demand **used in this** study are those suggested by the Agency, which **approximate** those estimated by the department. These values are **shown in Table 10** and total 142,000 acre-feet.

Total Water Demand

Summarized in Table 10 are the agricultural and urban water demands which are described in the preceding paragraphs. The total 1990 demand is 1,000,000 acre-feet.

TABLE 10

AGRICULTURAL AND URBAN WATER DEMANDS
IN 1990 FOR POTENTIAL MEMBER UNITS OF
KERN COUNTY WATER AGENCY

Potential Member Units		:	Acre-feet
<u>Agricultural</u>			
Antelope Plain Water District			40,000
Belridge Water Storage District			170,000
Lost Hills Water District			75,000
Rosedale-Rio Bravo Water Storage Dist.			60,000
Semitropic Water Storage District			150,000
Taft Agriculture			30,000
Wheeler Ridge-Maricopa W.S.D.			
Area No. 1	180,000		
Area No. 2	<u>40,000</u>		
			220,000
Kern River Delta and Others			<u>113,000*</u>
			858,000
<u>Urban</u>			
Bakersfield Urban Area			100,000
Taft Urban			31,000
Tehachapi-Cummings W. C. D.			6,000
Tejon Ranch Headquarters Area			<u>5,000</u>
			142,000
TOTAL			1,000,000

*Remainder-approximates amount suggested by
Kern County Water Agency.

Agricultural Water Demand Buildup

The rate of agricultural water demand buildup is correlated with the estimated future market demand. Since most of the acreage is expected to be devoted to specialty crops it is assumed that the demand for annual entitlements under the prototype contract will increase at the same rate as the market demand for these crops.

Surplus water, with its effect on the weighted cost of all irrigation water, is expected to allow the farming of lower value non-specialty crops which are not as susceptible to market constraints as higher value crops.

In areas where local ground water pumping is practiced, additional consideration is given to the future cost of pumping as the ground water level recedes. Only when and where the cost of pumping equals the cost of importing state water has project water been assumed to be used in any sizable quantity.

The projected rates of demand buildup to the 1990 quantities shown in Table 10 for potential member units of the Agency are presented in Table 11.

Urban Water Demand Buildup

The proposed rate of buildup to the total urban demand estimates suggested by the Agency are about the same as those projected by the department. The department projections are based on per capita water use and population growth.

The projected rates of demand buildup suggested by the Agency for potential urban service areas of the Agency are presented in Table 11.

TABLE 11
DEMAND BUILDUP AND MAXIMUM ANNUAL ENTITLEMENTS
FOR POTENTIAL MEMBER UNITS
KERN COUNTY WATER AGENCY

(In acre-feet)

Year	Antelope Plain W.D.	Belridge W.S.D.	Lost Hills W.D.	Rosedale- Rio Bravo W.S.D.	Semitropic W.S.D.	Tehachapi Cumplings W.C.D.-Urban	West Kern County Water District		Wheeler Ridge- Maricopa		Bakersfield Urban	Tejon Ranch Headquarters Area (Urban)	Kern River Delta and Others	Total
							Taft Agriculture	Taft Urban	Area #1	Area #2				
1968	8,000	34,000	15,000		30,000									87,000
69	8,800	37,400	16,500		33,000									95,700
1970	9,600	40,800	18,000	12,000	37,500		6,000				14,000		7,200	145,100
71	10,400	44,200	19,500	12,600	40,500		6,300				17,000		9,100	159,600
72	10,800	45,900	20,300	13,200	45,000	3,000	6,600	5,900	36,000	8,000	19,000	1,000	17,600	232,300
73	11,600	49,300	21,800	13,200	51,000	3,500	6,900	6,800	45,000	8,800	22,000	1,000	23,600	264,500
74	12,000	51,000	22,500	13,800	57,000	4,000	7,200	7,400	54,000	9,200	24,000	2,000	29,200	293,300
1975	12,800	54,400	24,000	14,400	63,000	4,500	7,500	8,100	63,000	9,600	26,000	2,000	34,800	324,100
76	14,800	62,900	27,800	15,000	67,500	5,000	9,000	9,000	72,000	10,000	29,000	2,000	39,800	363,800
77	16,800	71,400	31,500	18,000	73,500	5,500	10,200	9,600	81,000	12,000	31,000	2,000	44,400	406,900
78	18,400	78,200	34,500	21,600	79,500	5,800	12,000	10,200	90,000	14,400	33,000	3,000	49,300	449,900
79	20,000	85,000	37,500	24,600	85,500	6,000	13,200	11,200	99,000	16,400	36,000	3,000	54,500	491,900
1980	22,000	93,500	41,300	27,600	91,500	6,000	15,000	11,800	108,000	18,400	38,000	3,000	58,700	534,800
81	24,000	102,000	45,000	30,600	97,500	6,000	16,500	13,600	117,000	20,800	44,000	3,000	64,000	584,000
82	25,600	108,800	48,000	33,600	103,500	6,000	18,000	15,500	126,000	22,800	51,000	3,000	68,400	630,200
83	27,600	117,300	51,800	37,200	109,500	6,000	19,500	17,700	135,000	24,800	57,000	4,000	75,000	682,400
84	29,600	125,800	55,500	40,200	114,000	6,000	21,000	19,500	144,000	27,200	63,000	4,000	80,400	730,200
1985	31,200	132,600	58,500	43,800	120,000	6,000	22,500	21,400	153,000	29,200	69,000	4,000	85,700	776,900
86	32,800	139,400	61,500	46,800	126,000	6,000	23,400	23,300	162,000	31,200	75,000	4,000	91,100	822,500
87	34,400	146,200	64,500	50,400	132,000	6,000	25,500	25,100	171,000	33,600	81,000	4,000	96,400	870,100
88	36,400	154,700	68,300	52,800	138,000	6,000	27,000	27,300	180,000	35,600	88,000	5,000	102,100	921,200
89	38,000	161,500	71,300	56,400	144,000	6,000	28,500	29,100	180,000	37,600	94,000	5,000	107,500	959,900
90	40,000	170,000	75,000	60,000	150,000	6,000	30,000	31,000	190,000	40,000	100,000	5,000	113,000	1,000,000

CHAPTER VI. FINANCIAL FEASIBILITY

In the previous chapters of this report it has been indicated that in the Kern County Water Agency Service Area there is an immediate need for water to alleviate an overdraft of ground water and to provide for a healthy growth of agriculture. The provision for such growth is important to the economy of Kern County.

It has been further indicated that in the service area there are ample irrigable lands, suitable for the growing of high value crops to provide for agricultural growth, in addition to the lands presently irrigated with ground water which are in need of a supplemental water supply. Market outlook studies indicate there will be a market for crops which exceeds the amount of crops which could be grown on these lands with the water supply available from this project. About 1.5 million acre-feet of water are available for distribution to the San Joaquin Valley from the State Water Project.

Further, in Chapter V it has been indicated that if water is sold in the service area in 1990 at stated rates there will be a demand for about 1,000,000 acre-feet of water.

In this chapter there is presented an analysis which shows that, if water is retailed at rates within the users' abilities to pay and if benefits from the import of a supplemental supply of water are reasonably assessed in the service area of the Agency, it is feasible for the Agency to contract with the

State for a supply of 1,000,000 acre-feet of water annually. The analysis indicates that, through a sound program of financing based on water tolls and assessment revenues, the Agency can meet the cost of project water on a year-by-year basis. At the same time the water users can pay the Agency's toll for water as well as pay the cost for necessary land development and distribution system construction.

Financial Analysis

In the following paragraphs are discussed the various factors entering into the analysis. The analysis is presented in Table 16, "Financial Analysis - Kern County Water Agency," which is bound at the end of the report.

Agricultural Water Toll

From the cost-demand curves presented in Chapter V it can be shown that if water were sold in the Kern County Water Agency Service Area at the full cost of delivering water an effective demand for about 400,000 acre-feet of irrigation water could be realized in 1990. At the same time about 140,000 acre-feet of urban water would be used. As was previously pointed out, however, to overcome the ground water overdraft and assist the economy of this agriculturally oriented county there is a need to deliver more water for agricultural purposes. This additional required water would be used for irrigation only if water cost to the user were decreased from the full cost.

In this analysis it is assumed that water tolls by the Agency would be less than the State's charges at the same point.

The assumed agency tolls are shown in Table 12, "Agricultural Water Tolls at Canalside." When compared to the Agency's August 1962 analysis of payment capacity, these values range from the same to \$3.50 per acre-foot more than those prepared by the Agency. Since the water users' abilities to pay for water are lowest during the critical early years of the project while lands are being developed and distribution systems are constructed, the water tolls are escalated at the rate of 50 cents every five years for a total increase of \$2 per acre-foot by the year 1990.

TABLE 12

AGRICULTURAL WATER TOLLS AT CANALSIDE
(Dollars per Acre-foot)

Year	: Coastal : Aqueduct : Antelope : Plain : W.D.	: Semitropic, Bel- : ridge, Rosedale- : Rio Bravo W.S.D., : Lost Hills W.D., : Kern River Delta	California Aqueduct			
			: West Kern: : County : : W.D. : : Agri- : : culture	: Wheeler Ridge- : Maricopa W.S.D. : : : Area No. 1:	: Area No. 2	
1968	17.00	10.00				
69						
1970			14.00			
71						
72				15.00	22.00	
73						
74						
1975	17.50	10.50	14.50	15.50	22.50	
76						
77						
78						
79						
1980	18.00	11.00	15.00	16.00	23.00	
81						
82						
83						
84						
1985	18.50	11.50	15.50	16.50	23.50	
86						
87						
88						
89						
1990-						
2035	19.00	12.00	16.00	17.00	24.00	

The toll for surplus water delivered on an irrigation demand schedule to member units is assumed to be at the same rate as annual entitlements shown in Table 12.

Project water cost to the farm operators at the farm headgate is the sum of the unit local conveyance cost as presented in Table 9 and water toll at canalside as presented in Table 12. These are the values used to determine the maximum demand for water for each member unit.

Urban Water Toll

The urban areas have the capacity to repay the total water costs; consequently, it is assumed that tolls for municipal and industrial water would be established to recover each year's allocated cost. In years prior to water deliveries, when costs are allocated, it is assumed that the costs would be paid from the ad valorem assessment fund.

Benefited Area

Importation of water to Kern County will prove beneficial in varying degrees to the people living within the project service area. Farm operators presently utilizing ground water will witness savings from the reduction in cost of operating pumps as project water improves ground water conditions over those which would otherwise exist. Business people and urban dwellers, in addition to receiving project water for municipal and industrial uses, will benefit from the economic activity resulting from the growth of irrigated agriculture induced by project water.

In this study the benefited area is assumed to be the Kern County Water Agency Service Area as shown on Plate 2.

Present and Projected Assessed Valuations

The assessed valuation for the county totaled \$718,046,000 in 1960 as compared to \$521,595,000 in 1950, an increase of some 36 percent. The average annual increase over the past 14 years is 3.7 percent. Much of this rise is the result of population increases and economic development. Inflation also is responsible for some of the appreciation in assessed valuation. Table 13, "Historical Assessed Valuations, Kern County," shows the growth of assessed valuation for Kern County from 1948 to the present.

TABLE 13
HISTORICAL ASSESSED VALUATIONS
KERN COUNTY

Year	Assessed Valuation	Percentage Increase Over Previous Year
1948-49	\$ 466,077,000	
1949-50	521,595,000	11.9
1950-51	505,892,000	-3.0
1951-52	533,694,000	5.5
1952-53	562,803,000	5.5
1953-54	581,242,000	3.2
1954-55	617,163,000	6.2
1955-56	624,801,000	1.2
1956-57	650,970,000	4.2
1957-58	679,776,000	4.4
1958-59	718,618,000	5.7
1959-60	718,046,000	-0.1
1960-61	735,710,000	2.5
1961-62	744,919,000	1.3
1962-63	766,835,000	2.9

For purposes of determining reasonable assessment rates in the benefited area, projections of assessed valuation of

property located within the boundaries of the Agency have been made. These estimates are based on the expected increases in population and irrigated acreage. Trends in mineral rights valuation were also considered. The 1990 valuation within the Agency's service area is expected to reach about \$874,000,000. Included in these values are mineral rights valuation. These projections are believed to be conservative in view of the recent increases in valuation witnessed in the county and also because per capita and per acre valuations have been projected at the present level over the next 30 years. Projected assessed valuations are shown in Table 14.

TABLE 14
PRESENT AND PROJECTED ASSESSED VALUATIONS

Fiscal Year	:	Kern County	:	Kern County Water Agency Service Area
1959-60		\$ 718,046,000		\$458,000,000
1969-70		830,000,000		540,000,000
1979-80		1,000,000,000		661,000,000
1989-90		1,317,000,000		874,000,000

Bonded Indebtedness

The Kern County Water Agency has no bonded indebtedness at the present time. The total bonded indebtedness for the county in the year 1961-62 was about \$35,000,000 which was about five percent of its assessed valuation. This ratio of bonded indebtedness to assessed valuation has remained practically constant during the past five years. The present debt ratio for

Kern County is quite favorable compared to other counties. This is shown in Table 15, "Bonded Indebtedness Compared with Assessed Valuations by Counties."

TABLE 15
BONDED INDEBTEDNESS
COMPARED WITH ASSESSED VALUATIONS BY COUNTIES*

County	: 1960-61 : Bonded Indebtedness in Percent : of Assessed Valuation
Fresno	7.8
Kern	5.1
Kings	5.5
Los Angeles	18.8
Orange	16.0
Riverside	14.3
San Bernardino	12.5
San Diego	17.4
San Luis Obispo	8.5
Santa Barbara	10.8
Tulare	4.5
Ventura	18.9

*Counties to be served from California or Coastal Aqueduct.

Financial Analysis Table

Presented in Table 16 is a year-by-year summary of the assumed revenues from sale of water by the Agency to its member units; the costs which would be charged to the Kern County Water Agency by the State for annual entitlement and surplus agricultural water, and municipal and industrial water; the difference between revenues and costs or the net operating revenues; the revenues which would accrue from the ad valorem assessment of benefits; and the calculations of balance of funds remaining at the end of each year.

Included in the table is a list of the assumed rates of ad valorem assessment for project benefits. The initial rate in 1964-65 is 50 cents per \$100 of assessed valuation. The rate decreases to 25 cents in the year 2011.

Other combinations of water tolls and assessment rates can provide sufficient revenues to meet the costs allocated to the Agency.

These rates reflect a reasonable assessment of the benefits and approximate those suggested in the agency negotiating committee's August 1962 payment capacity analysis. During the early years of the project substantial amounts of revenue in excess of cost are generated. These assessment revenues accumulate in 1994 to a maximum of over \$50 million, including interest at 4 percent. Thereafter, the assessment fund is reduced and is depleted at the end of the repayment period.

Although the net revenues are assumed to accumulate interest, these funds could be used to partially finance the construction of distribution systems and/or make advance payments to the State. The latter would be equivalent to investment of the net revenues at 4 percent if the project interest rate, which is dependent upon the interest rate on bonds yet to be sold, develops to be 4 percent as is presently assumed.

The financial analysis contains many assumptions as to matters which are in the province of the directors of the Kern County Water Agency. It is believed, however, that the assumptions employed are sufficiently representative to

demonstrate that not only is the suggested program financially feasible but that it would remain so with reasonable variation in the assumptions.

To more fully explain the significance of the values in each column of the financial analysis table, explanations of the column headings are as follows:

Explanation of Column Headings in Table 16

<u>Column Number</u>	<u>Comments</u>
1	Years of the period of analysis, commencing in fiscal year 1965, the year after assumed signing of contract in 1963 and approval of the program by a referendum, and terminating in 2035, the assumed end of 50-year repayment period following final project construction.
2	Delivery of annual entitlements for agricultural and municipal and industrial purposes. The total demand and the rate of demand build-up are those proposed by the department on June 13, 1963.
3	Annual delivery of surplus water on an irrigation demand schedule. This class of water is assumed to be used in agricultural areas of Kern County Water Agency Service Area. Its use terminates after the year 1981, the last year of availability of such surplus water.
4	Total annual delivery to the Agency of water for all purposes. (Sum of Columns 2 and 3).
5	Delivery of annual entitlements of agricultural water.
6	Annual delivery to agricultural areas of surplus water on an irrigation demand schedule.

Explanation of Column Headings in Table 16 (continued)

<u>Column Number</u>	<u>Comments</u>
7	Total annual delivery to agricultural areas. (Sum of Columns 5 and 6).
8a	Weighted average assumed agency water toll to member units at canalside. Escalation of 50 cents per acre-foot every five years conforms with pricing program presented in agency negotiating committee's August 1962 payment capacity analysis. (Footnote 1 indicates charge to member units of Kern County Water Agency).
8	Total revenue from delivery of annual entitlement of agricultural water. (Product of Columns 5 and 8a).
9a	Weighted average of assumed agency water toll to member units for surplus water on an irrigation demand schedule.
9	Total annual revenue from delivery of surplus water on an irrigation demand schedule. (product of Columns 6 and 9a).
10	Total annual revenue from delivery of both classes of water to agricultural areas. (Sum of Columns 8 and 9).
11	Annual repayment requirements for annual entitlements of agricultural water to be paid to State on a unit rate basis allowed under provisions of Article 45 of the prototype contract.
12a	Cost per acre-foot of delivering surplus water on an irrigation demand schedule.
12	Total annual cost of delivering surplus water on an irrigation demand schedule. (Product of Columns 12a and 6).

Explanation of Column Headings in Table 16 (continued)

<u>Column Number</u>	<u>Comments</u>
13	Total annual cost of delivering both classes of irrigation water. (Sum of Columns 11 and 12).
14	Difference in cost of delivering agricultural water and estimated revenues received by the Kern County Water Agency from the sale thereof. (Column 10 less Column 13).
15	Schedule of delivery of annual entitlements of municipal and industrial water for use within Kern County Water Agency Service Area.
16	Annual repayment requirements to be paid to State for delivery of municipal and industrial water calculated on the basis of provisions of Articles 22 through 28, of prototype contract.
17	Repayment requirements in years prior to delivery of water to municipal and industrial areas. After start of such water delivery, annual toll assumed to equal the annual cost of delivering water for municipal and industrial use.
18	Projected assessed valuation of properties within the Kern County Water Agency Service Area as shown on Plate 2. Projection generally based on estimated increases in population and growth in irrigated acreage. Additional consideration given to trends in mineral rights valuation. Values remain constant from 1990 on the assumption that increases in assessed valuation beyond that year will be reserved for additional water projects.

Explanation of Column Headings in Table 16 (continued)

<u>Column Number</u>	<u>Comments</u>
19	Assumed assessment rate to be levied on properties located within Agency service area.
20	Revenue generated by the ad valorem assessment (1/100 of product of Columns 18 and 19).
21	Balance of available funds from previous year plus revenue collected by Kern County Water Agency from ad valorem assessment in current year. (Sum of Column 25 of previous year and Column 20 of current year).
22	Sum of net operating revenue of agricultural and municipal and industrial water. (Sum of Columns 14 and 17).
23	Balance of Kern County Water Agency funds after meeting financial assistance requirement. (Column 21 less Column 22).
24	Interest earning on balance of Kern County Water Agency funds (Product of .04 and Column 23).
25	Balance of funds available to Kern County Water Agency annually. (Sum of Columns 23 and 24).

CHAPTER VII. SUMMARY AND CONCLUSIONS

The pertinent information presented in this report is summarized and conclusions are presented in the following sections.

Summary

1. The Kern County Water Agency was formed in 1961 for the express purpose of obtaining a supplemental water supply for Kern County. It is empowered to contract with the State for a water supply, to make ad valorem assessments in accordance with benefits, and to contract to supply water to its member units.

2. The California Water Commission has assigned 1,475,000 acre-feet of water from the State Water Project to the San Joaquin Valley, and an additional 72,000 acre-feet have been reserved as of June 1963 for the valley from other assignments if needed.

3. The importance of agriculture to Kern County is demonstrated by the 1960 value of agricultural and livestock production of approximately \$247 million. Agriculture accounts for more employment in the county than any other enterprise.

4. Excellent lands are available within the Kern County Water Agency Service Area for a larger growth of agriculture than could be supported by the expected market for crops or than could be supplied with water from the State Water Project.

5. There is a need for supplemental water supply in the Agency's service area to meet the present annual overdraft of about 700,000 acre-feet and to provide water for continued agricultural and urban growth. It is estimated the 1990 supplemental requirement for water would be 1,700,000 acre-feet if only the available lands and market demand were considered.

6. The State Water Project can provide water to the agency at an equivalent unit rate for annual entitlements of \$20.42 per acre-foot for agricultural water and \$20.18 per acre-foot for municipal and industrial water. It is estimated the cost of surplus water under the provisions of the proposed amendments to the Standard Provisions for Water Supply Contract would average \$4.39 per acre-foot north of the Buena Vista Pumping Plant and \$5.85 between Buena Vista Pumping Plant and Wheeler Ridge Pumping Plant I. During the early critical years of the project from 1968 through 1981 it is estimated the blended charge by the State to the agency for annual entitlements and surplus water for agriculture would average \$14.80 per acre-foot.

7. The 1960 assessed valuation of the Agency's service area was about \$458 million, and it is estimated it will increase to about \$874 million in 1990.

8. The Kern County Water Agency has no present bonded indebtedness. The 1960-61 indebtedness of Kern County was about \$35 million. The ratio of debt to assessed valuation was 5.1 percent.

9. With agricultural water prices established at rates approximating the ability of water users to pay and with ad valorem assessments for benefits accruing from the importation of water through the State Water Project made at reasonable rates, it is estimated the Agency's agricultural water demand in 1990 would be 858,000 acre-feet. The annual urban water demand would be 142,000 acre-feet in the same year.

Conclusions

1. The State of California has the necessary water supply and the authority to enter into a contract with the Kern County Water Agency for the service of 1,000,000 acre-feet of water annually to the Agency from the State Water Project.

2. The contractual cost to the Agency can be met with a sound financial program of agricultural water tolls based on the ability of users to pay for water and ad valorem assessments for benefits accruing from the importation of water through the State Water Project, and the acceptance of the proposed amendments to the Standard Provisions for Water Supply Contract concerning surplus water and surcharge credit.

3. The Agency is in a favorable position to enter into such a contract because of the substantial assessed valuation in Kern County and the moderate total of bonded indebtedness.

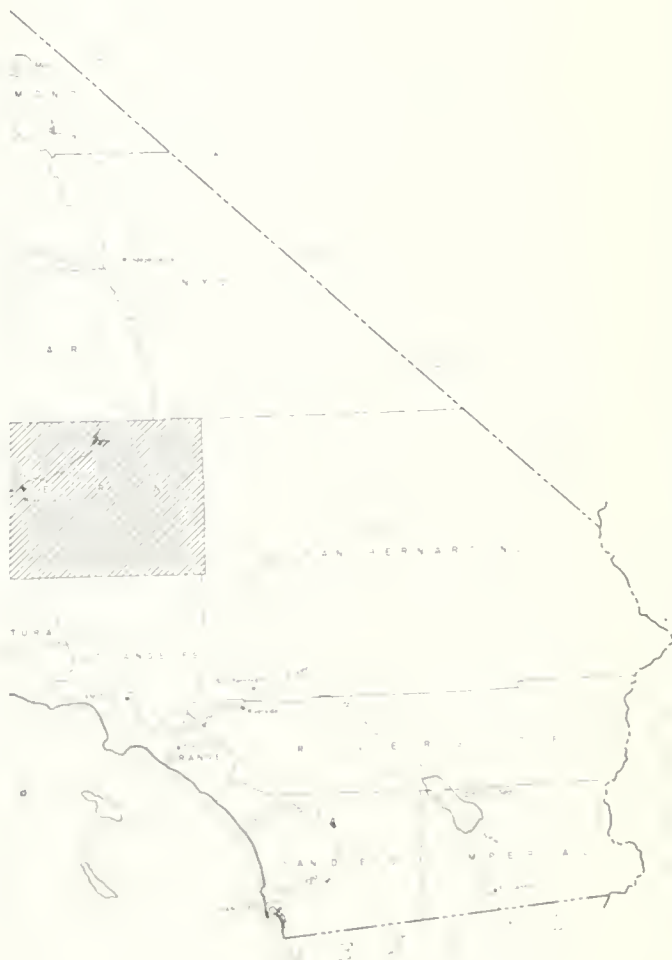
4. The Kern County Water Agency has the authority, the necessity, and the financial capability to enter into a contract with the State of California for the service of 1,000,000 acre-feet of water annually from the State Water Project.

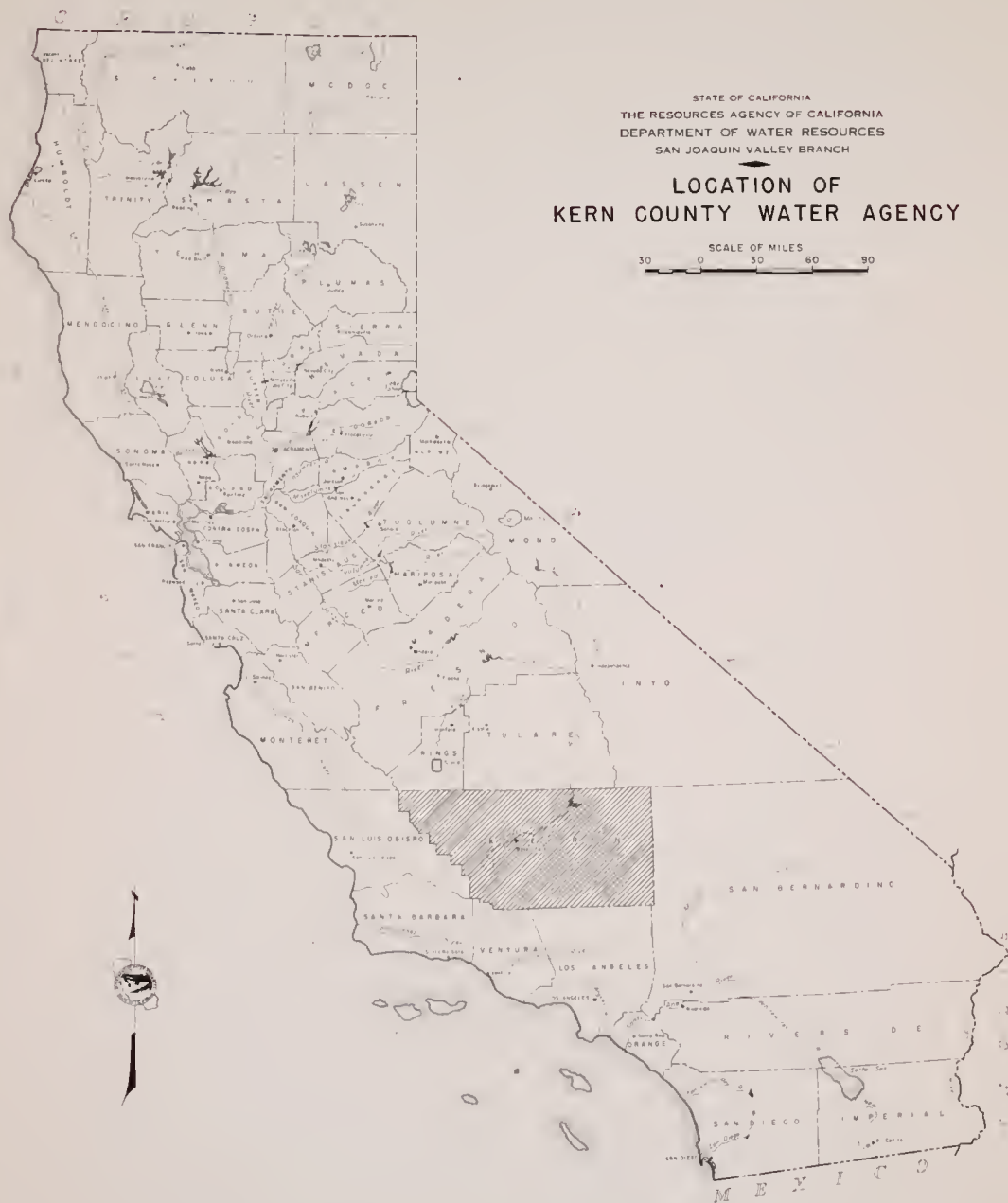
5. This contract deserves the support of the voters of Kern County.

STATE OF CALIFORNIA
 THE RESOURCES AGENCY OF CALIFORNIA
 DEPARTMENT OF WATER RESOURCES
 SAN JOAQUIN VALLEY BRANCH

LOCATION OF KERN COUNTY WATER AGENCY

SCALE OF MILES
 30 0 30 60 90



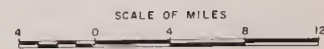


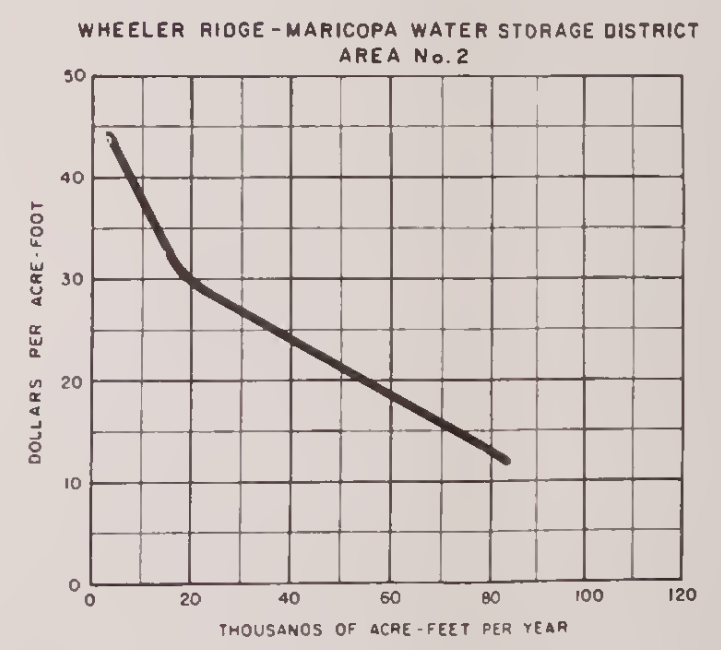
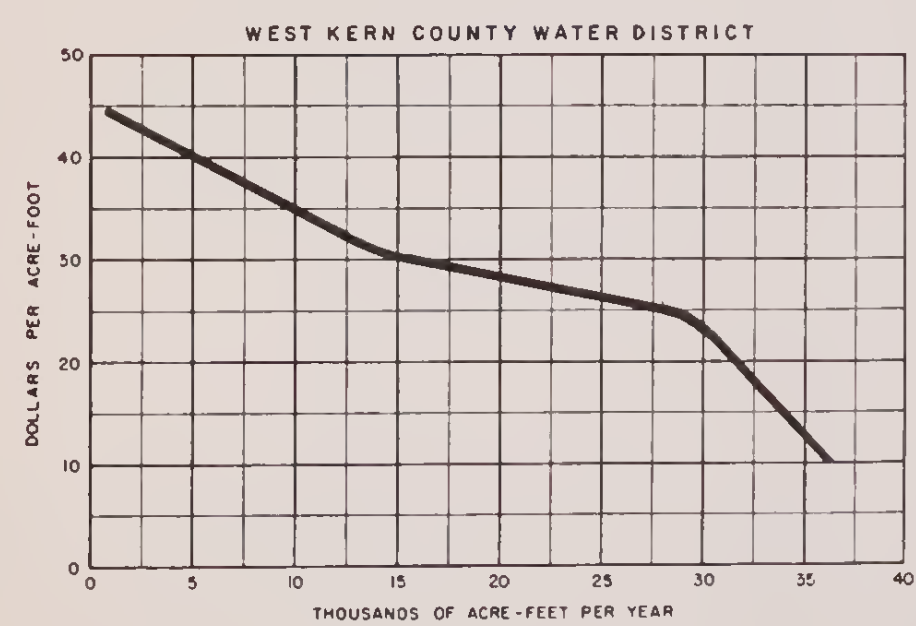
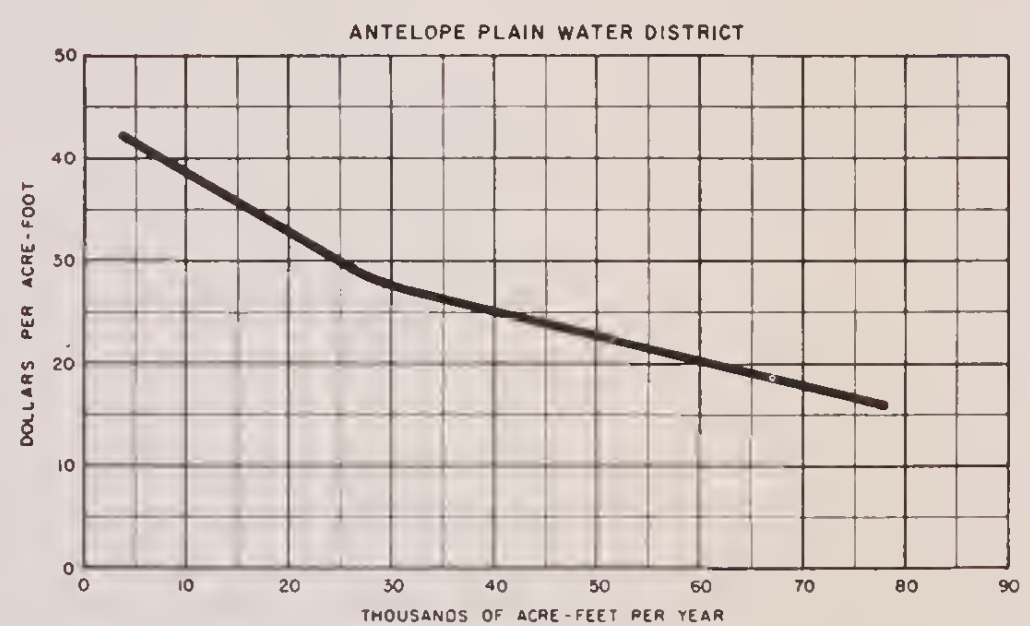
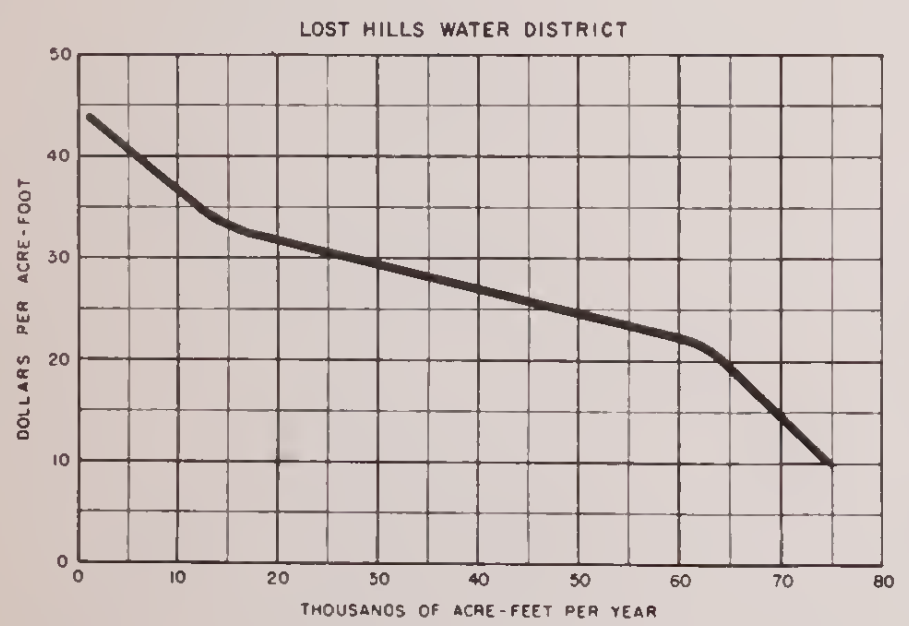
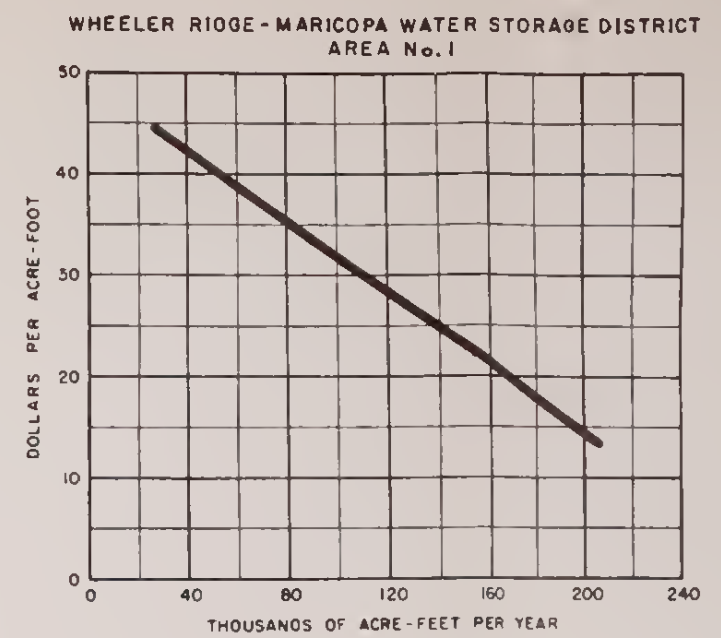
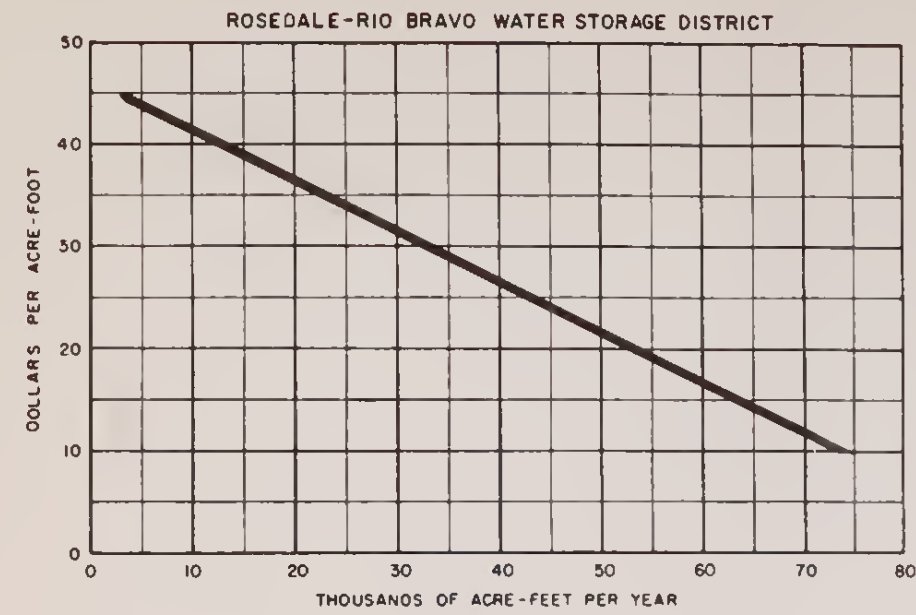
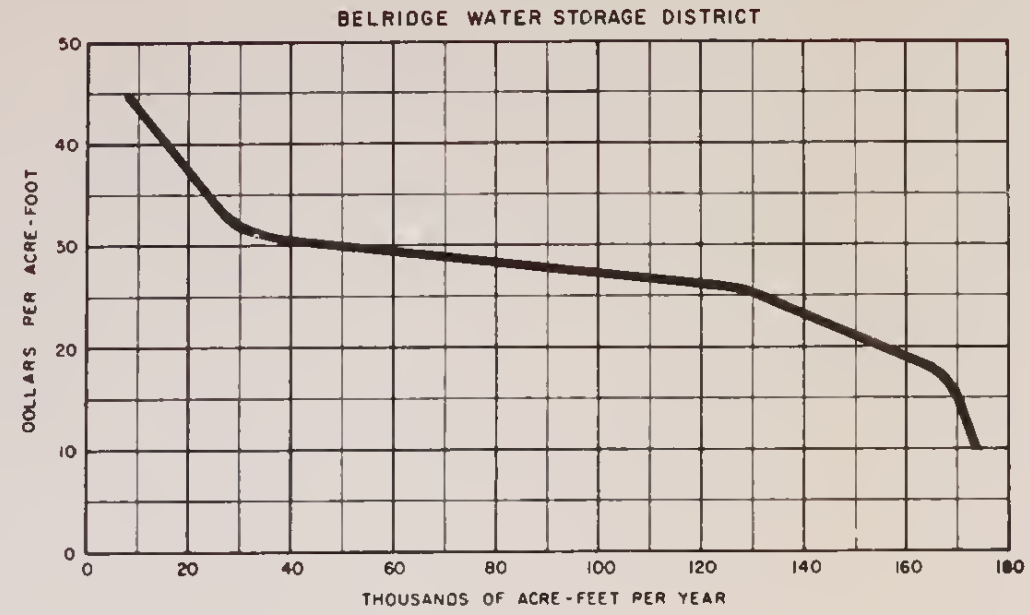
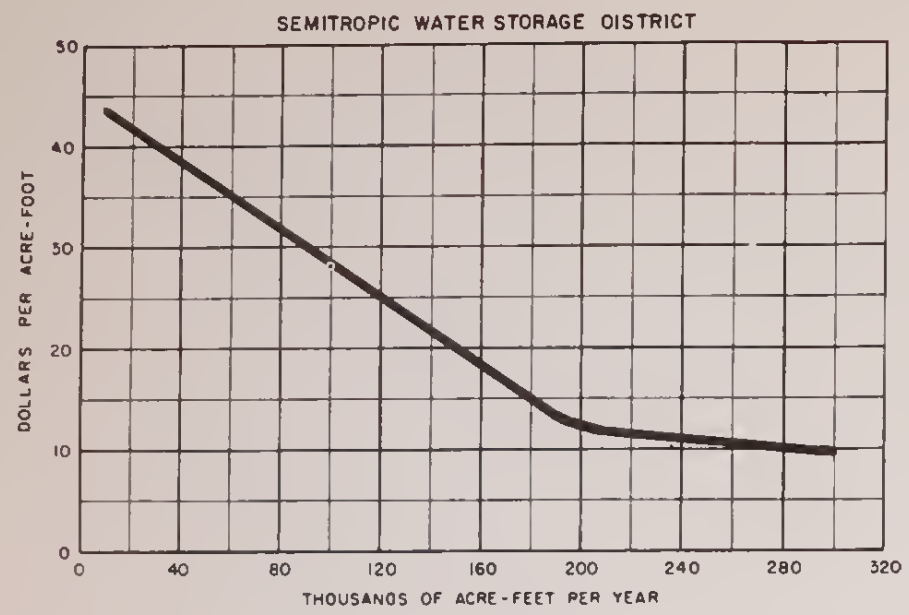
LEGEND

— APPROXIMATE SERVICE AREA BOUNDARY



STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SAN JOAQUIN VALLEY BRANCH
**KERN COUNTY WATER AGENCY
SERVICE AREA
1963**





IRRIGATION WATER COST-DEMAND CURVES FOR POTENTIAL MEMBER UNITS
OF
KERN COUNTY WATER AGENCY

TABLE 16

FINANCIAL ANALYSIS--KERN COUNTY WATER AGENCY
1,000,000 Acre-Feet of Water

Year	Agricultural Water										Municipal and Industrial Water		Ad Valorem Revenue		Previous Year Revenue ADV Revenue	Total Net Operating Revenue	Balance After Annual Debt Service	Interest at 4 Percent	Balance at end of year								
	Annual Water Deliveries For All Users (In Acre-Feet)			Annual Agricultural Water Deliveries (In Acre-Feet)			Annual Irrigation Water Revenues			Annual Costs			Net Operating Revenue	Annual M & I Water Deliveries (In Acre-Feet)						Financial Aspects							
	Entitlement	Surplus	Total	Entitlement	Surplus	Total	Per Acre-Feet	Total	Per Acre-Feet	Total	Total	Per Acre-Feet								Surplus	Total	Annual Cost	Net Operating Revenue				
																								8a	8 = 5 x 8a	9a	9 = 6 x 9a
1	2	3	4 = 2 + 3	5	6	7 = 5 + 6	8a	8 = 5 x 8a	9a	9 = 6 x 9a	10 = 8 + 9	11	12a	12	13 = 11 + 12	14 = 10 - 13	15	16	17	18	19	20	21	22 = 14 + 17	23 = 21 - 22	24	25 = 23 + 24
1965																		\$ 113,500	\$ -113,500	\$497,000,000	\$ 0.50	\$ 2,485,000	\$ -113,500	\$ 2,371,500	\$ 94,900	\$ 2,466,400	
66											\$ 75,700							225,300	-225,300	505,000,000		2,595,000	-225,300	4,766,100	130,600	4,956,700	
67											1,973,700							375,600	-375,600	514,000,000		2,570,000	-451,300	7,075,400	283,900	7,359,400	
68	87,000	89,300	176,300	87,000	89,300	176,300	\$ 10.64	\$ 986,000	10.64	950,200	\$ 1,876,200		\$ 6.92	\$ 618,000	\$ 75,700			533,800	-533,800	528,000,000		2,610,000	-1,269,300	306,400	9,661,800	9,968,200	
69	95,700	84,900	180,600	95,700	84,900	180,600		1,018,000	10.64	903,300	1,921,300	2,110,200	5.80	492,400	2,602,600	-681,300			582,200	-582,200	531,000,000	2,655,000	11,722,900	-1,263,500	10,459,400	418,400	10,877,800
1970	145,100	46,200	191,300	131,100	46,200	177,300	10.70	1,403,000	10.70	494,300	1,897,300	2,945,700	5.31	245,300	3,191,000	-1,293,700	14,000		740,200		540,000,000	2,700,000	13,577,800	-1,293,700	12,284,100	491,400	12,775,500
71	150,600	51,900	211,500	142,600	51,900	194,500	10.69	1,524,000	10.69	554,800	2,078,800	3,152,600	4.49	233,000	3,392,600	-1,306,800	17,000		802,300		558,000,000	2,760,000	15,335,500	-1,306,800	14,028,700	569,100	14,597,800
72	232,300	0	232,300	203,400	0	203,400	11.86	2,416,000	0	0	2,416,000	4,391,800	0	0	4,391,800	-1,973,800	28,900		984,000		564,000,000	2,820,000	17,647,000	-1,973,800	15,644,000	652,800	16,296,800
73	264,500	236,100	500,600	231,200	236,100	467,300	11.90	2,751,000	11.90	2,809,600	5,560,600	4,852,100	4.87	1,149,800	6,001,900	-441,300	33,300		1,149,800		558,000,000	2,880,000	19,149,800	-441,300	18,708,500	708,200	19,416,700
74	293,300	212,800	506,100	255,900	212,800	468,700	11.93	3,053,000	11.93	2,538,700	5,591,700	5,279,200	4.85	1,032,100	6,311,300	-719,600	37,400		1,084,800		588,000,000	2,940,000	22,396,800	-719,600	21,677,200	867,100	22,544,300
1975	324,100	307,000	631,100	283,500	307,000	590,500	12.75	3,527,000	12.44	3,819,100	7,346,100	5,764,900	4.65	1,482,800	7,247,700	-498,400	40,600		1,121,700		600,000,000	3,000,000	25,544,300	-498,400	25,045,900	1,025,700	26,068,400
76	363,800	239,300	603,100	318,800	239,300	558,100	12.44	3,965,000	12.44	2,976,900	6,942,900	6,435,500	5.01	1,196,500	7,639,000	-689,100	46,000		1,182,600		612,000,000	3,060,000	29,728,400	-689,100	29,039,300	1,161,600	30,200,900
77	406,900	169,400	576,300	358,800	169,400	528,200	12.47	4,474,000	12.47	2,112,400	6,586,400	7,122,000	5.00	847,000	7,609,000	-1,382,600	48,100		1,216,300		624,000,000	3,120,000	31,128,000	-1,382,600	31,275,600	1,321,800	32,597,400
78	446,900	359,900	806,800	397,900	359,900	757,800	12.51	4,978,000	12.51	4,418,800	9,396,800	8,597,400	5.12	1,806,800	10,402,200	-1,011,400	52,000		1,372,800		636,000,000	3,180,000	32,395,800	-1,011,400	31,384,400	1,476,600	32,861,000
79	491,900	331,100	823,000	435,700	331,100	766,800	12.53	5,459,000	12.53	4,148,700	9,607,700	9,323,100	5.11	1,691,900	11,015,000	-1,407,300	56,200		1,425,700		649,000,000	3,245,000	40,044,800	-1,407,300	38,637,500	1,545,500	40,183,000
1980	534,800	305,100	839,900	476,000	305,100	781,100	13.05	6,212,000	13.05	3,981,600	10,193,600	10,200,700	5.24	1,508,700	11,799,400	-1,605,800	58,800		1,481,700		661,000,000	3,158,000	41,152,200	-1,605,800	39,546,400	1,662,100	41,211,300
81	584,000	169,300	753,300	517,400	169,300	686,700	13.07	6,762,000	13.07	8,974,800	11,025,300	11,025,300	5.29	895,600	11,920,900	-2,946,100	66,600		1,588,800		682,000,000	3,060,000	46,289,300	-2,946,100	43,337,200	1,733,500	45,070,700
82	630,200	0	630,200	554,700	0	554,700	13.08	7,281,000	13.08	7,281,000	11,885,300	11,885,300		0	11,885,300	-4,570,300	75,500		1,703,900		703,000,000	3,164,000	44,970,300	-4,570,300	40,398,000	1,786,000	42,184,000
83	682,400	0	682,400	597,700	0	597,700	13.08	7,818,000	13.08	7,818,000	12,675,600	12,675,600		0	12,675,600	-4,857,600	84,700		1,835,500		725,000,000	3,263,000	46,674,000	-4,857,600	41,816,400	1,786,000	43,602,400
84	730,200	0	730,200	637,700	0	637,700	13.10	8,354,000	13.10	8,354,000	13,488,200	13,488,200		0	13,488,200	-5,134,200	99,500		1,936,200		746,000,000	3,357,000	48,926,100	-5,134,200	43,791,900	1,751,700	45,543,600
1985	776,900	0	776,900	676,500	0	676,500	13.60	9,200,000	13.60	9,200,000	14,264,900	14,264,900		0	14,264,900	-5,064,900	109,400		2,039,800		767,000,000	3,452,000	48,995,600	-5,064,900	43,930,700	1,757,200	45,687,900
86	822,500	0	822,500	714,200	0	714,200	13.61	9,720,000	13.61	9,720,000	14,626,200	14,626,200		0	14,626,200	-4,206,200	108,300		2,078,000		788,000,000	3,586,000	49,233,000	-4,206,200	44,327,700	1,773,100	46,100,800
87	876,100	0	876,100	754,000	0	754,000	13.62	10,260,000	13.62	10,260,000	15,364,600	15,364,600		0	15,364,600	-5,695,600	116,100		2,165,500		810,000,000	3,645,000	49,714,000	-5,695,600	44,018,400	1,786,000	45,804,400
88	921,300	0	921,300	794,900	0	794,900	13.63	10,834,000	13.63	10,834,000	16,113,200	16,113,200		0	16,113,200	-5,279,200	126,300		2,307,100		831,000,000	3,746,000	50,176,200	-5,279,200	44,897,000	1,786,000	46,683,000
89	958,900	0	958,900	824,800	0	824,800	13.60	11,217,000	13.60	11,217,000	16,632,200	16,632,200		0	16,632,200	-5,415,200	134,100		2,397,800		852,000,000	3,834,000	50,586,900	-5,415,200	45,171,700	1,804,500	46,976,200
1990	1,000,000	0	1,000,000	858,000	0	858,000	14.07	12,072,000	14.07	12,072,000	17,224,100	17,224,100		0	17,224,100	-5,152,100	142,000		2,477,300		874,000,000	3,933,000	50,849,200	-5,152,100	45,697,100	1,827,900	47,525,000
91											17,190,900	17,190,900		0	17,190,900	-5,118,900			2,469,600				51,458,000	-5,118,900	46,339,100	1,853,600	48,192,700
92											17,190,900	17,190,900		0	17,190,900	-5,118,900			2,469,600				51,458,000	-5,118,900	46,339,100	1,853,600	48,192,700
93											17,187,300	17,187,300		0	17,187,300	-5,112,300			2,469,600				51,458,000	-5,112,300	46,339,100	1,853,600	48,192,700
94											17,186,400	17,186,400		0	17,186,400	-5,114,400			2,469,600				51,458,000	-5,114,400	46,339,100	1,853,600	48,192,700
1995											17,184,600	17,184,600		0	17,184,600	-5,112,600			2,468,900				51,458,000	-5,112,600	46,339,100	1,853,600	48,192,700
96											17,183,700	17,183,700		0	17,183,700	-5,111,700			2,468,900				51,458,000	-5,111,700	46,339,100	1,853,600	48,192,700
97											17,182,800	17,182,800		0	17,182,800	-5,110,800			2,468,900				51,458,000	-5,110,800	46,339,100	1,853,600	48,192,700
98											17,181,900	17,181,900		0	17,181,900	-5,109,900			2,468,900				51,458,000	-5,109,900	46,339,100	1,853,600	48,192,700
99											17,181,000	17,181,000		0	17,181,000	-5,109,000			2,468,900				51,458,000	-5,109,000	46,339,100	1,853,600	48,192,700
2000											17,224,100	17,224,100		0	17,224,100	-5,152,100			2,477,300				52,782,800	-5,152,100	47,630,700	1,906,900	49,537,600
01											17,190,900	17,190,900		0	17,190,900	-5,118,900			2,469,600				52,636,900	-5,118,900	47,518,000	1,901,200	49,419,200
02											17,190,900	17,190,900		0	17,190,900	-5,118,900			2,469,600				52,489,300	-5,118,900	47,368,400	1,895,500	49,263,900
03											17,190,900	17,190,900		0	17,190,900	-5,118,900			2,469,600				52,337,700	-5,118,900	47,216,800	1,880,000	49,096,800
04											17,187,300	17,187,300		0	17,187,300	-5,112,300			2,469,600				52,186,100	-5,112,300	47,064,800	1,865,000	48,929,800
1995											1																

1/ Based on initial onalside charges of \$10/AF to Sanmitropic, Lost Hills, Belridge, Rosedale-Rio Bravo, and Kern River Deltas; \$17/AF to Antelope Plain; \$18/AF to Tarrt Agriculture; \$15/AF to Wheeler Ridge-Maricopa No. 1; and \$20/AF to Wheeler Ridge-Maricopa No. 2. Water charge increases at the rate of about 50 cents every five years until 1990. Thereafter toll remains constant. Surplus toll is not escalated.

2/ Based on "Pay as you go" program once water delivery begins. Initial year's payment requirements made from tax balance.

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